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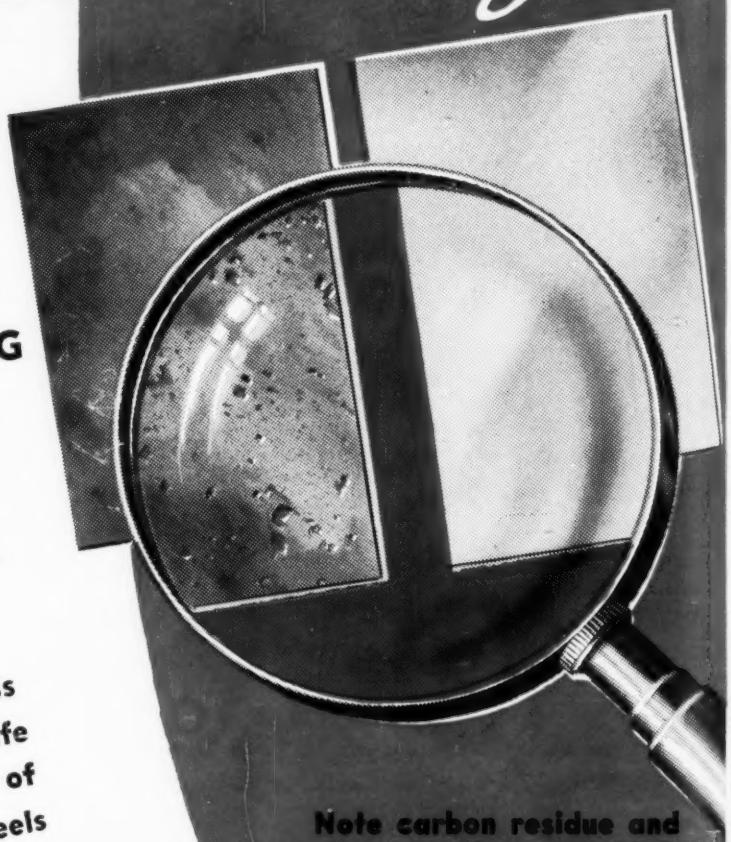

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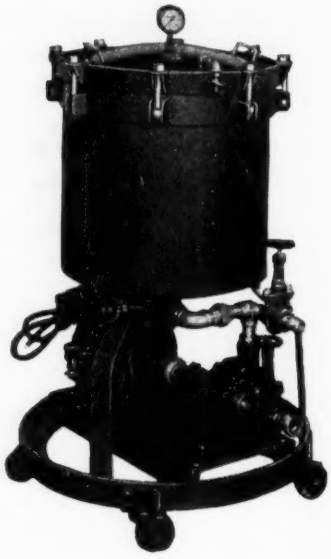

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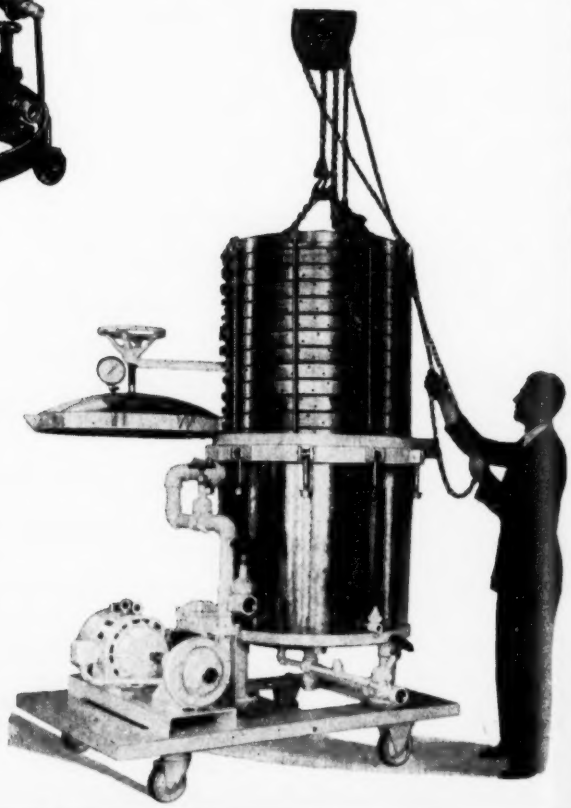

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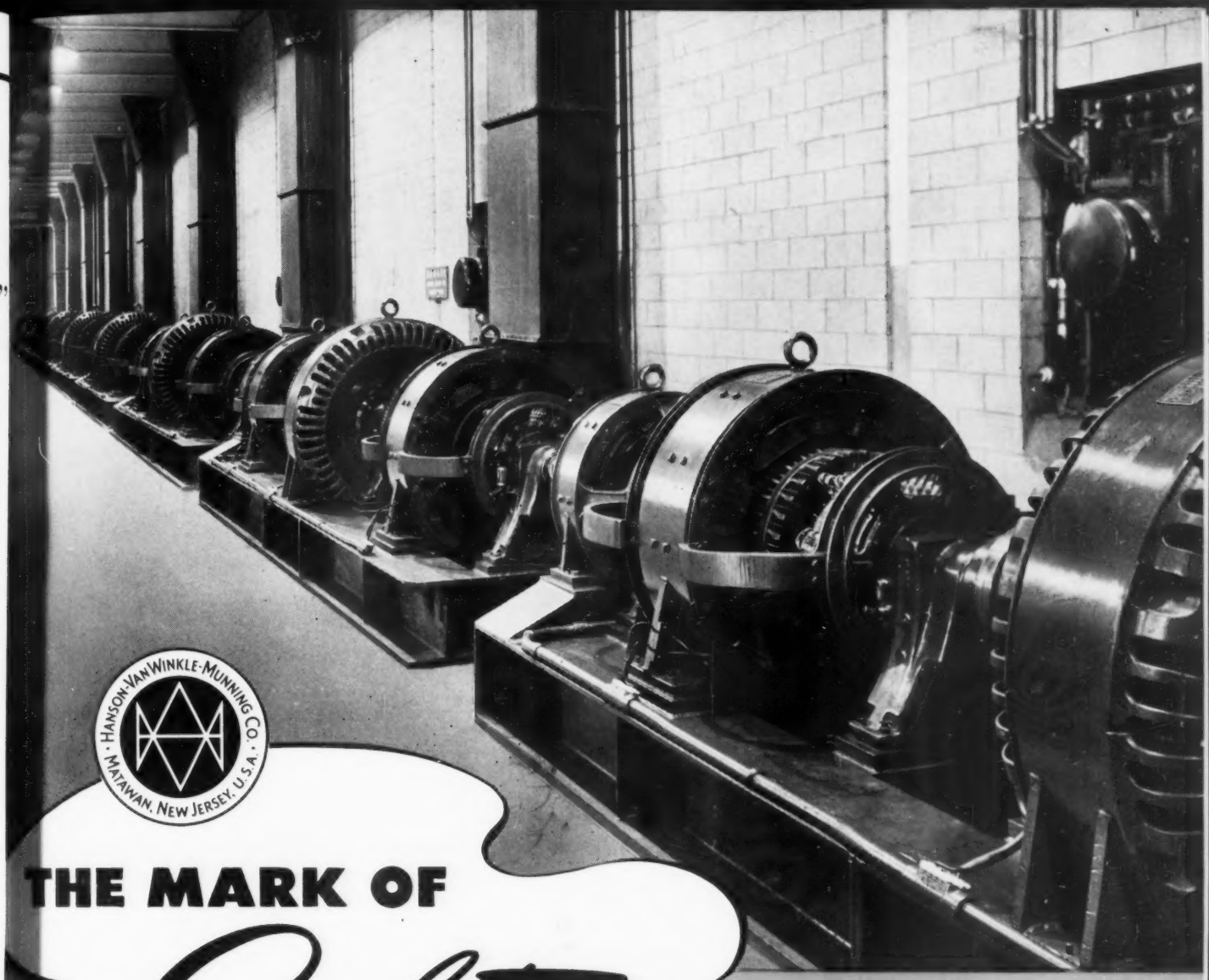

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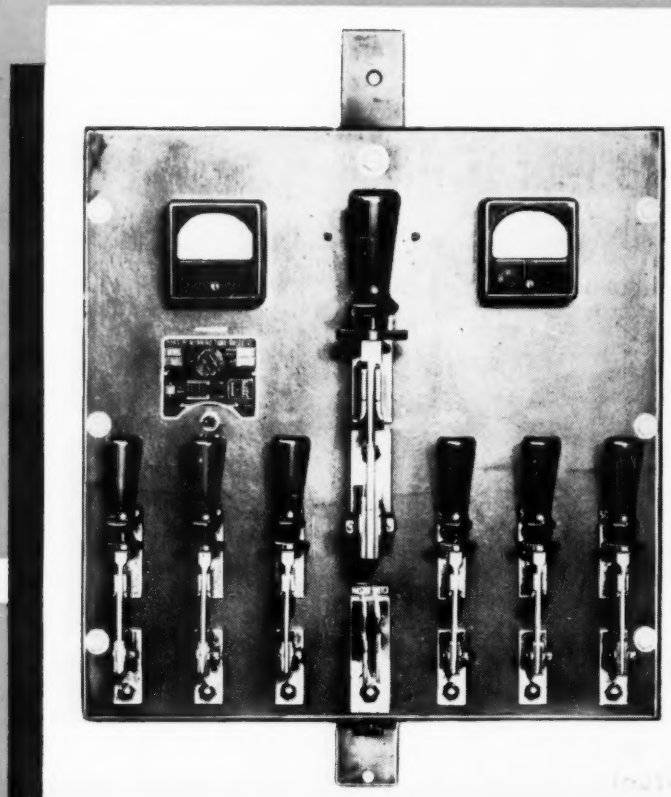

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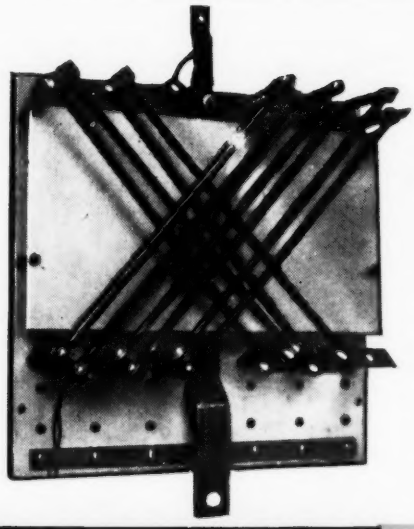

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PREPARATION, ELECTROPLATING, COATING

APPRENTICE TRAINING

The requirements of the war program, soon after commencement of hostilities, confronted manufacturers and purchasers of finishing services with the disturbing fact that many platers were lacking the technical and practical background necessary for effective application of electrodeposits. The situation became so serious that the occupation of electroplater was listed as critical by the War Manpower Commission.

The elaborate national apprenticeship program, which is now being carried out by the WMC will undoubtedly eliminate any future recurrence of such a situation, since plating and metal polishing, as skilled trades, are included in this program. The former requires an apprenticeship of three years and the latter four years, and the courses provide for full time employment in the plant, under proper supervision, in addition to a minimum of 144 hours per year spent in related theoretical and practical training in a designated local vocational school. Provisions for regular salary increases during such apprenticeships will be further inducement for young men anxious to acquire skill in a trade.

Employment qualifications, classification rules, and instructions programs are determined by the Apprentice-Training Service of the WMC and each individual apprenticeship agreement between employer and apprentice is officially registered with the Federal Committee on Apprenticeship or in the State apprenticeship council, in the twenty-six states in which they are already established. Upon completion of the term of apprenticeship, the apprentice becomes an all-round skilled plater or polisher and is awarded a "Certificate of Completion of Apprenticeship." During normal times only young men between certain age limits are acceptable, but, war veterans may register, even though beyond such age limitations, and will be given credit for experience or training prior to their service in the armed forces.

To date, apprenticeship programs have already been established in more than 30,000 manufacturing plants, construction and miscellaneous industries and we feel certain that such training will, in a few years, be reflected in the improved general quality of plating, improvement of which will be of inestimable assistance in meeting the competition of light metals and plastics in the post-war period.

High-Speed Alkaline Tin Plating[1]

By MARTIN M. STERNFELS* and FREDERICK A. LOWENHEIM**

History

THE successful application of coatings of tin by electrodeposition is a relatively recent development. The earliest baths were of the alkaline type, and regardless of the starting chemicals the final solution was almost invariably a stannite electrolyte. Since the anode reaction was not well understood, even when stannates were used, the bath was so operated as quickly to reduce them to stannites[2]. In spite of many attempts to improve the stannite baths, they remained unreliable because of the impossibility of preventing oxidation, and the difficulty of controlling the anode reactions. Another obstacle to the widespread use of electrotinning baths was the ease with which tin coatings could be applied by hot-dipping.

The acid bath has had a shorter history than the alkaline. Originally developed as a tin-refining electrolyte and used extensively during World War I, the fluosilicate bath was gradually transformed into the sulfate bath of today by the step-by-step elimination of the fluosilicate and its replacement with sulfate, which was made possible by the development of the appropriate colloidal addition agents.

Meanwhile, following the earlier work of Foerster[3], it gradually came to be realized that successful operation of an alkaline bath depended on control of the anode reaction. Proctor[4], Oplinger[5] and Wernlund and Oplinger[6] gave practical directions for making up and operating sodium stannate baths under such conditions that the anodic formation of stannite would be minimized or counteracted by the addition of oxidizing agents. Later work[7] has illuminated the nature of the anode reactions and has tended to give a scientific basis for some of the earlier empirical procedures. At present the sodium stannate bath has practically completely superseded the earlier stannite solutions.

The history of tin plating has been reviewed by Kern[8], Pine[9] and Oplinger and Bauch[10].

These later developments in tin plating coincided with a revolution in steel-rolling procedure; hot-rolling of sheets in packs was giving way to the present continuous cold-rolling of strip. The principal use for this strip is in the manufacture of tin cans, and it was natural that continuous methods of tinning the iron should be sought, to supplant the older sheet-by-sheet molten tin dip. The hot-dip process did not seem to be adaptable to the coating of continuous coils, and attention was turned to electroplating. As early as 1935 some of the steel companies began pilot-plant experiments with the continuous electrotinning of steel strip[11]. When the need for strict conservation of our tin supplies became imperative, enough had been done with the process to justify the immediate installation of electrotinning lines by all the steel companies involved in this phase of the business, so that by the end of 1944 about 30-35% of all the tinplate made in the country was electrotinned[12]. The installations represent over 1,000,000 amperes of installed capacity and a cost of about $30,000,000.

Strip electrotinning is merely the most spectacular, but by no means the only, large-scale use for tin plating: the softness, corrosion-resistance and non-toxicity of tin have led to its use on refrigerator, automotive and aircraft parts, paper-mill machinery, food processing equipment, etc. Where the metal is to be applied to complicated shapes, electroplating with a bath of high throwing-power has its advantages.

Modern Baths

With the expanded use of tin have come new and improved tin plating solutions; those in use today may be divided into two groups: acid and alkaline. Both types of electrolytes have their supporters; in general, their relative merits may be briefly summarized[13].

Acid baths all have the advantage that, since the tin is in the stannous (bivalent) form, at the same current efficiency a given number of ampere-hours will deposit twice as much tin from an acid as from an alkaline stannate bath, where the tin is in the quadri- state. Current efficiencies are better in the acid solutions, and densities usable with some of them are much higher than in sodium stannate bath. The lower voltage at which these baths although often a difficult matter for the plater to control, a further advantage.

Against these advantages, which all tend in the direction plating from the acid solutions, the alkaline electrolyte offers greater ease of control; notably better throwing power; lack sity for organic addition agents with their attendant difficontrol; the fact that the hot alkaline solutions are good and therefore make the preplating cleaning somewhat less the ability to use the cheaper and more easily repaired equipment with the alkaline bath. The alkaline bath offers overall flexibility. Finally, there is some evidence that plate is better from alkaline solutions than from acid[14]. While statement may be open to dispute, there is little doubt that it to get a good deposit from the alkaline stannate bath.

The advantages of the acid baths are in the direction of at high speeds of operation, while those of the alkaline solu in flexibility, versatility, and ease of control. The choice of the other type will be dictated by individual circumstances; the field of strip steel plating, where the acid solutions have their greatest use, fully half the steel companies chose baths[13], while for job-plating, special set-ups and the plating requiring high throwing power, the stannate solutions are the choice.

The sodium stannate bath in use today does not differ important respect from that originally proposed by Oplinger Wernlund in their patents taken out in 1933[5, 6, 10, 15]. La has shown that the sodium acetate is an inert ingredient and unnecessary[7b] and that if proper anode control is exercised, tions of hydrogen peroxide or sodium perborate are likewise fluous[16]. Satisfactory results from the sodium stannate bath on the presence during operation of the yellow-green and which indicates that the anodes are dissolving as stannate. cases poor or spongy deposits can be traced to the presence bath of stannite ions (bivalent tin).

Potassium vs. Sodium

The principal limitation of the sodium stannate bath has lack of good cathode efficiency at high current densities; words, the relatively slow rate of plating in this solution. current densities of 25-40 amp./sq.ft. are generally recommended and attempts to increase the plating speed much beyond nullified by a rapid falling-off in the cathode efficiency[10]. Ma compositions have been investigated without appreciably widen useful current density range of the bath[7c].

It might be supposed that raising the tin concentration of or increasing its temperature, would increase the current which could be used. But here we run into the relatively lo bility of sodium stannate, lowered still more by the presence of hydroxide, and the odd fact that the solubility of sodium decreases as the temperature is raised. This expedient is ruled out, and the case seems hopeless unless some radically solution can be found.

This solution the authors have found in the potassium bath[1]. Figure 1 shows that potassium stannate is considerably soluble than sodium stannate, and in addition, as the temperature increased, more of the potassium salt will go into solution more of the sodium salt crystallizes out. Thus, in the presence mol of alkali per liter (5.3 oz./gal. NaOH or 7.5 oz./gal. KOH 194°F, the sodium solution can contain 13.3 oz./gal. of tin while potassium bath can contain 45.4 oz./gal. Although it is true increase in tin concentration beyond a certain point has been not to have much effect on the operating characteristics of the stannate bath, nevertheless the potassium system offers

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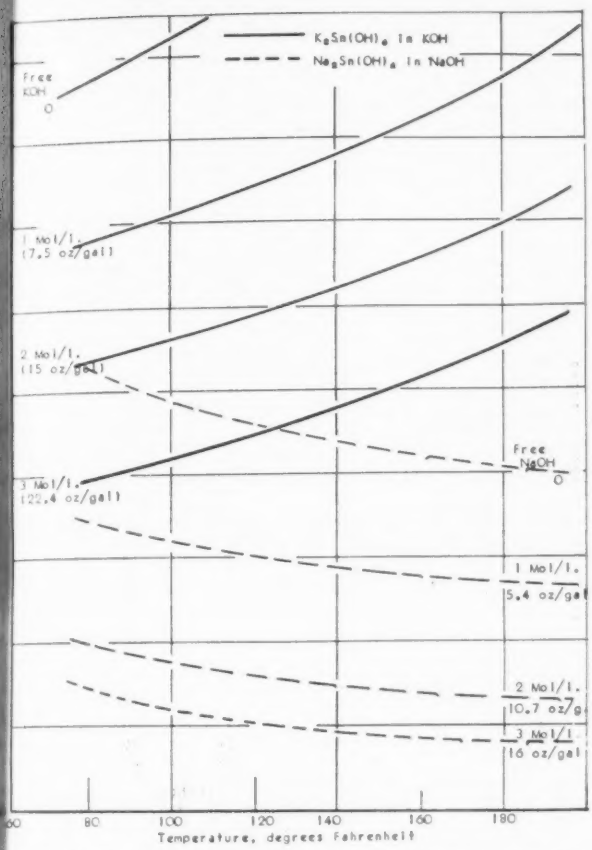


Fig. 1. Solubility of potassium and sodium stannates in water and alkali solutions.

greatly increased range of useful compositions that quite different results are obtained. The two systems differ in many of their properties.

Potassium stannate solutions are more stable than the corresponding sodium stannate solutions: that is, they are less subject to hydrolysis with the attendant precipitation of insoluble tin compounds as sludge. Figure 2 shows the appearance of two potash and two soda solutions, the analyses of which are given in Table I, after one week at 176°F. and six days at 203°F. The superior stability of the potash baths is evident. It has also been exhibited in commercial application; in a strip electrotinning line less than 60 lb. of tin were found in the sludge filtered from 20,000 gallons of solution over a two-months' period of operation. That is, of 6,600 lbs. of tin in the bath, less than 1% had precipitated out.

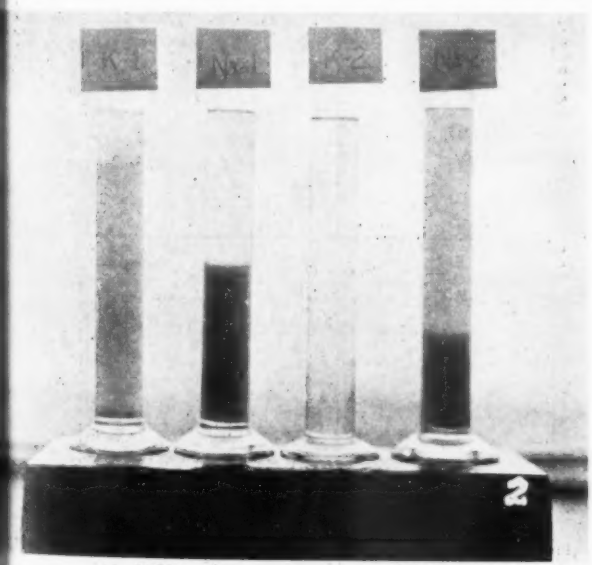


Fig. 2. Comparative decomposition of potassium and sodium baths.

TABLE I

	Total Alkali	Tin oz./gal.		Loss in Tin	
	oz./gal.	Before	After	oz./gal.	% of Total Tin
K-1	6.57	5.37	5.31	.06	1.2
Na-1	5.44	5.28	4.91	.37	7.1
K-2	15.15	9.63	9.88	—	0
Na-2	12.05	10.79	10.27	.52	4.8

Since the potassium ion has a higher mobility than the sodium ion, potassium stannate solutions have greater conductivity than their sodium counterparts. An extensive investigation led to the conclusion that potash baths were 25% more conductive than their stoichiometric soda equivalents. The conductivity is increased by raising the temperature and the free caustic or carbonate concentration; and decreases very slightly as the stannate concentration is raised. The superior conductivity of the potash bath has been reflected in a 20% greater current flow without increase in voltage in a practical installation; obviously, the saving may be had in the form of lower voltage for the same current.

Both the sodium and potassium stannate baths produce deposits of good quality over a wide range of operating conditions; both have excellent throwing power; neither requires any addition agents, nor is either sensitive to the presence of many foreign ions, except stannite. The main basis for distinguishing their characteristics is in

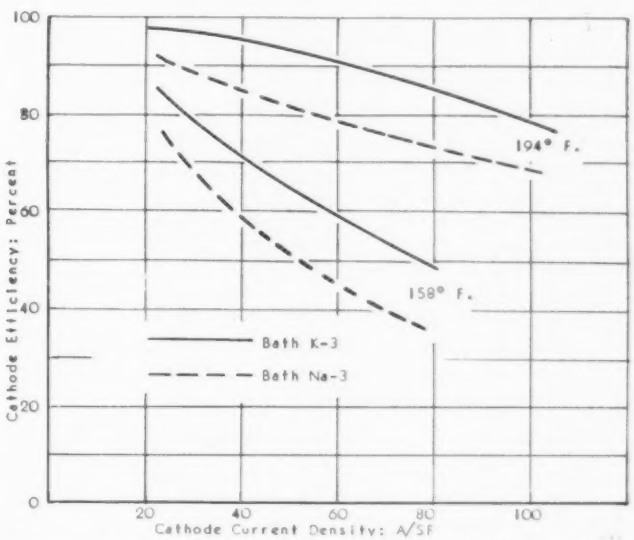


Fig. 3. Cathode efficiencies of baths K-3 and Na-3 at 158° and 194°F.

the curves of cathode efficiency vs. current density, which determine the plating speed obtainable with a given bath. Anode efficiency curves are also of importance, since they determine whether a given solution will remain at a good operating level without excessive additions of chemicals.

Figures 3, 4 and 5 compare the solutions of Table II at 158°F and 194°F. Herein, solution Na 3 represents the conventional sodium stannate bath and solution K 3 is its potassium analog. Solution Na 4 is a soda bath of higher concentration and solution K 4 the potash analog. Solution K 5 is a very concentrated potash bath which has no soda analog; the sodium salt is simply not soluble enough to form a solution of the corresponding strength.

TABLE II

Solution	Tin		Free NaOH		Free KOH	
No.	oz./gal.	mol/l	oz./gal.	mol/l	oz./gal.	mol/l
Na 3	6.0	.38	1.07	0.2	——	—
K 3	5.6	.35	——	—	1.47	0.2
Na 4	18.5	1.17	1.73	0.3	——	—
K 4	18.9	1.20	——	—	2.13	0.3
K 5	38.7	2.44	——	—	2.13	0.7

Figure 3 shows that cathode efficiency is improved even in the conventional operating range by substituting potash for soda and also by operating at 194°F rather than at 158°F.

Figure 4 (Baths Na 4 and K 4) shows that in more concentrated solutions the cathode efficiency of the potash bath is much more markedly superior to that of the soda solutions. In this case the soda bath could not be tested at 194°F because sodium stannate began to crystallize out at about 175°F.

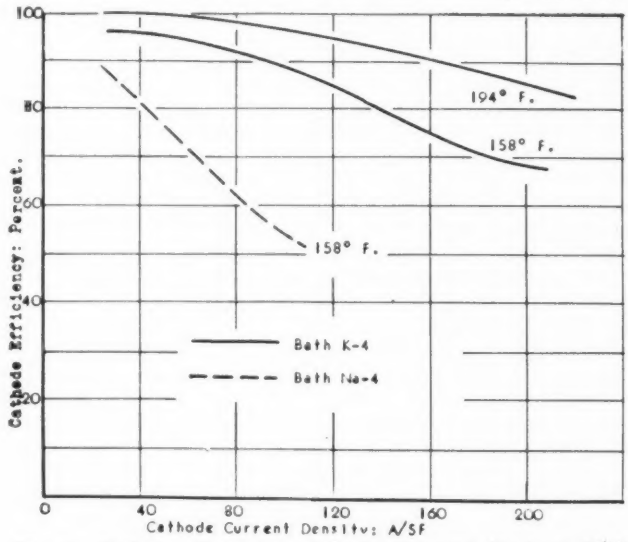


Fig. 4. Cathode efficiencies of baths K-4 and Na-4 at 158° and 194° F.

In Figure 5 the data for the cathode efficiency of a solution practically saturated (at room temperature) in potassium stannate (K 5) are plotted against the cathode current density. It is worthy of note that at 194°F cathode efficiencies of 80% or better are obtained up to current densities of practically 1000 amp./sq.ft., and even at 158°F the cathode efficiency does not fall to 80% until a density of 180 amp./sq.ft. is reached. It is needless to say that such plating speeds represent a new phenomenon in alkaline tin plating.

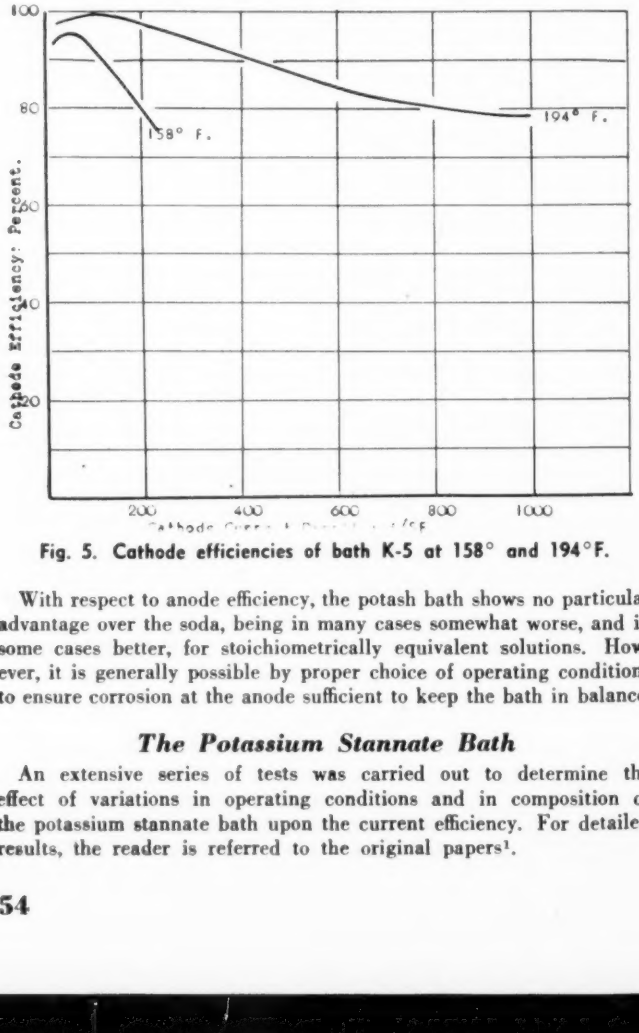


Fig. 5. Cathode efficiencies of bath K-5 at 158° and 194°F.

With respect to anode efficiency, the potash bath shows no particular advantage over the soda, being in many cases somewhat worse, and in some cases better, for stoichiometrically equivalent solutions. However, it is generally possible by proper choice of operating conditions to ensure corrosion at the anode sufficient to keep the bath in balance.

The Potassium Stannate Bath

An extensive series of tests was carried out to determine the effect of variations in operating conditions and in composition of the potassium stannate bath upon the current efficiency. For detailed results, the reader is referred to the original papers[1].

It has already been mentioned that the effect of increasing perature is to raise both the cathode and anode efficiency; th ductivity is also improved. The obvious conclusion can be draw the bath should be operated at as high a temperature as po due regard being taken for heating costs vs. current costs.

Figure 6 illustrates the effect of the tin concentration, th alkali content being constant, on the cathode current efficienc

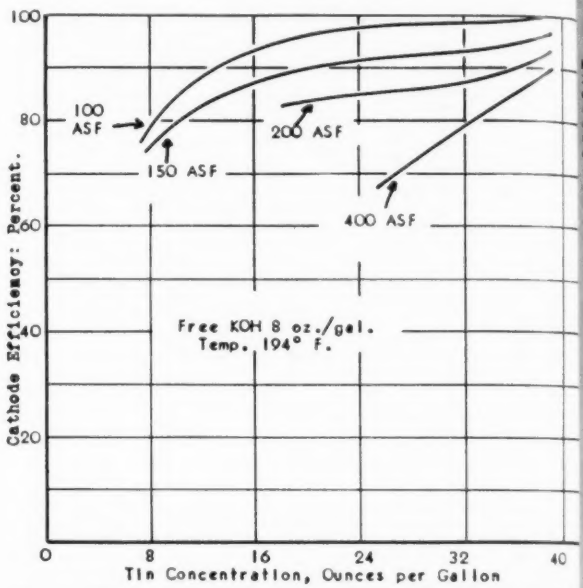


Fig. 6. Effect of tin concentration on cathode efficiency of po sium stannate baths. Free KOH content 8 oz./gal. Tempera 194°F.

increase of the tin concentration raises the efficiency at a give rent density, or permits the use of a higher current density w decrease in efficiency. Thus, at a current density of 100 amp. the cathode current efficiency of a solution containing 8 oz. free KOH is 77% at 9 oz./gal. tin, 95% at 18 oz./gal., 98%

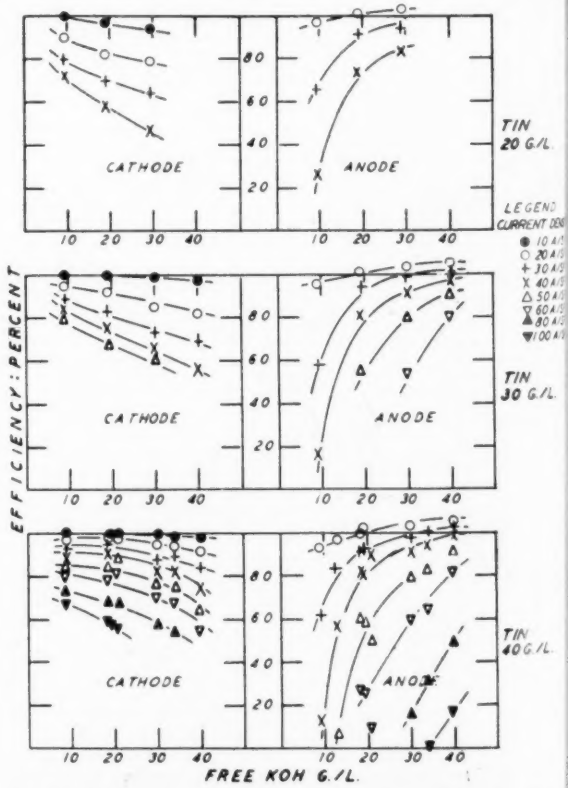


Fig. 7. Effect of free KOH upon the cathode and anode efficien of solutions containing 20, 30 and 40 grams per liter of Temp. 90°C.

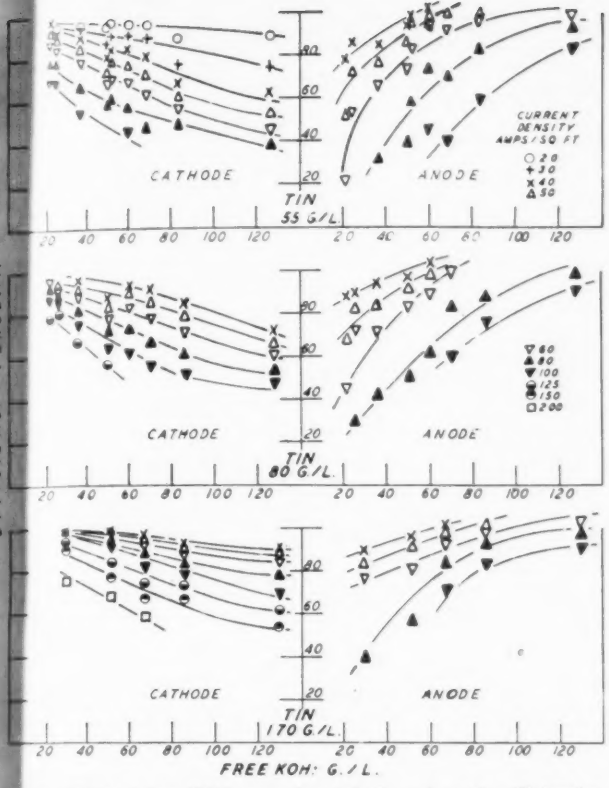


Fig. 8. Effect of free KOH upon the cathode and anode efficiencies of solutions containing 55, 80 and 170 grams per liter of tin. Temp. 90°C.

oz./gal., and 99% at 38 oz./gal. From the other point of view, if a cathode efficiency of 85% is desired, this may be obtained at 100 amp./sq.ft. with 11 oz./gal. of tin, at 150 amp./sq.ft. with 13 oz./gal., at 200 amp./sq.ft. with 24 oz./gal., or at 400 amp./sq.ft. with 33 oz./gal.

An increase in tin content likewise raises the anode current efficiency, although to a lesser extent, and slightly decreases the critical anode current density.

If the free KOH content of the bath be increased, the cathode efficiency falls to a greater or less extent, depending on plating conditions. Thus, in a solution containing 18 oz./gal. of tin, at 50 amp./sq.ft., raising the free alkali from 1.2 oz./gal. to 13.2 oz./gal., at 194°F will lower the efficiency from 100% to 84%; at 158°F the cathode efficiency will be cut nearly in half. On the other hand, increasing the free KOH raises the anode current efficiency at a given current density, or permits the use of a higher current density without loss in efficiency. These effects are shown in the typical curves Figures 7, 8, 9 and 10.

With the potassium bath, as with the sodium bath, conditions at the anode are in general more critical than those at the cathode. If anode current density is too high, or free caustic too low, the anodes become covered with an insoluble brown or black film, and do not dissolve, so that the bath is quickly depleted of tin. Too, this film is a poor conductor of electricity, so that its presence requires the use of notably higher voltages to pass the same amount of current. On the other hand, if the anode current density is too low, or the free alkali too high, the greenish-yellow film, the presence of which is necessary to insure that the anodes dissolve as stannate (quadrivalent tin), cannot be maintained on the surface of the anodes. The film dissolves, and the anodes then dissolve as stannite (bivalent tin), the effect of which, in causing rough, spongy and non-adherent deposits, is well known.

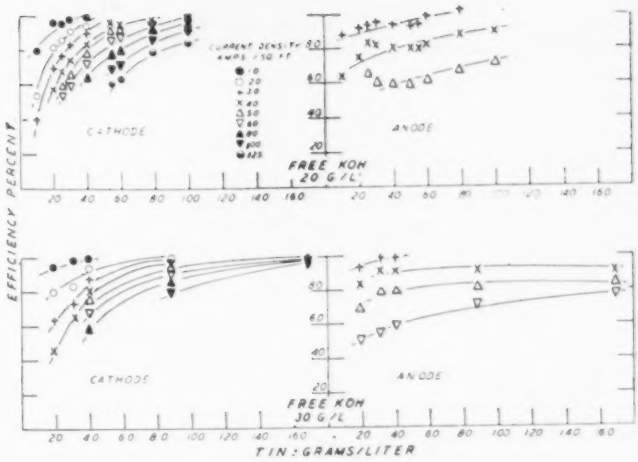


Fig. 9. Effect of tin concentration upon the cathode and anode efficiencies of solutions containing 20 and 30 grams per liter free KOH. Temp. 90°C.

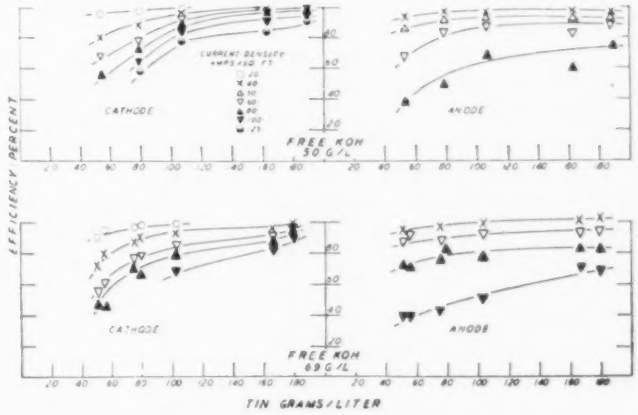


Fig. 10. Effect of tin concentration upon the cathode and anode efficiencies of solutions containing 50 and 69 grams per liter free KOH. Temp. 90°C.

For proper anode control a knowledge of the critical anode current density is helpful. This is defined as that current density which must be momentarily impressed upon the anodes in order to form the familiar greenish-yellow film [7a]. After forming the film, the current is reduced to the proper operating value, which in general is about 50-70% of the critical density. The critical anode current density is not a fixed value, even for a given solution composition and temperature, but also depends on such factors as degree of agitation, time allowed for the film to form, etc. However, if the experimental conditions are maintained constant, the effect of variations in operating conditions upon the critical density can be studied. These tests show that the critical anode current density increases with increase in free caustic and with a rise in temperature, and decreases slightly as the tin content is raised.

Means for forming the anode film will vary. Most generators will tolerate momentarily the overload necessary to insure film formation. Where the anodes are small and easily handled, they may be lowered into the tank one by one, so that each in turn receives a surge of current which will form the film.

(To be concluded in March)

New Design of Humidity Cabinet for Corrosion Testi

By FLOYD TODD

Quaker Chemical Products Corporation, Conshohocken, Pa.

THE corrosion-testing cabinet described herein was designed to give an accurate and reproducible comparison of the relative efficiencies of corrosion preventives which are to be used under indoor storage conditions, including intermediate protection in the process of manufacture.

These conditions differ in kind as well as in degree. For indoor protection the rust-preventive coatings should possess sufficient solubility in suitable solvents to be very easily removed. For outdoor protection it may suffice that the compound be roughly removable, for example, by wiping. Furthermore, for outdoor protection any appreciable water-solubility of the protective agent is very objectionable, as rain would remove any water-soluble ingredients, while for indoor protection it may even be desirable, so long as it does not make the product hygroscopic or susceptible to dew or condensation.

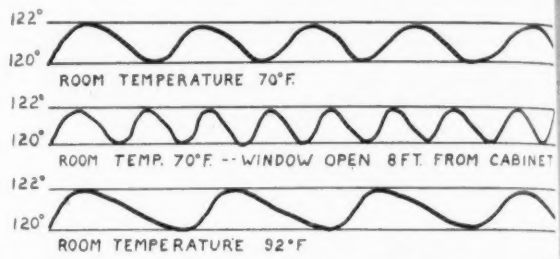
Testing an outdoor type of compound under indoor conditions, or an indoor compound under outdoor conditions, may lead to adopting materials inadequate for the purpose intended, or to discarding products which would have been most advantageous.

This article presents a new testing device for accelerated corrosion tests under extreme indoor conditions (high temperature, high humidity, air exchange, condensation of moisture without washing-out effect, radiation, and such added chemical corrosive influences as may be desired). This cabinet is based on experience accumulated over more than a decade with all types of corrosion-testing devices, and provides a more accurate control of the variables than any other type known to the author.

Cabinets previously used include the conventional type, which consists of a closed space, provided with a spray or bubbling type of humidifier, means for circulating the air, and electrically actuated heater and thermoregulator.[4-8] Other types provide for sealed cabinets, operating at high humidity in alternating cycles of higher and lower temperature (Ball Bearing Engineers' Committee). The "weatherometer" is a well-known apparatus adopted for corrosion tests under outdoor conditions.[1] Salt-spray cabinets are used for accelerated testing of the relative corrosion proofing efficiencies of protective coatings for metals which may be subjected to sea air exposure.[2, 3]

In all prior apparatus the heating has been centralized in too small an area. As a result, convection currents and radiation effects have occurred within the cabinets, causing uneven exposure conditions and consequent serious irregularities in corrosion test results. Furthermore, many humidity cabinets are square or rectangular in shape. Such a design is conducive to undesirable channeling of air and moisture in those cabinets which operate under the usual dynamic exposure conditions.

In any thermostatically controlled apparatus, whether humidity or salt-spray cabinet, the temperature fluctuates within a range of 1° to 3° F. (0.5556° to 1.6668° C.), because of the lag in the regulator. These variations be accentuated by convection currents. Even when the perature fluctuates within constant limits, the actual sion temperature ratio may vary greatly, depending o quality of insulation and the temperature and ventilati the air surrounding the apparatus. This is illustrated b following curves, which show the temperature charts i same cabinet, in which the regulator shuts off the he 122° F. and starts heating 120°, a better than average ra



On the upward slope on the temperature curve the in the cabinet is less than saturated with moisture; on downward slope it is supersaturated, and condensation occur. This condensation is irregular and emphasizes slight surface irregularity of the samples. Moreover, type of cycle profoundly affects the corrosion behavior, l ing to appreciable discrepancies in corrosion time and ticularly in corrosion types, dependent on external fac not controlled in any cabinet specifications with which author is familiar.

A humidity cabinet for corrosion testing has there been designed in order to eliminate the disadvantages prior cabinets. Its design gives additional advantages herent in only this type of cabinet.

The walls and bottom are heated over a preponde area. This heating is effected by means of the vapors constantly boiling liquid and is therefore absolutely unif and lagless. Convection currents are thus comple eliminated.

Still more important, the temperature "curve" is her straight line, the cycles of recurrent sub- and supersatu tions are eliminated completely, because the temperatur that of the boiling point of a constant-boiling liquid, and mechanical regulation is necessary.

The uniformity of the temperature and humidity co tions within the cabinet give accurate comparisons of relative efficiencies of corrosion preventives, platings, w nishes, or other protective coatings. These results can accurately reproduced.

By using cyclopentane as the heating liquid a temperat of 120° F. (49° C.) is maintained, which is a commo specified condition. By selecting the heating liquid, pra cally any temperature desired can be maintained exac

The air used in the cabinet is preheated to the temperat of the cabinet and prehumidified to 100% before it ent the cabinet chamber, regardless of the operating temp ture of the cabinet or of outside conditions.

Air and water entering the cabinet are automatically accurately controlled and are not affected even by relativ wide variations in the laboratory or plant lines.

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The design avoids corners or sharp angles, which tend to cause irregularities in air currents within the cabinet. The only variable, that of the effect on boiling point of variation of atmospheric pressure, has proved practically insignificant.

Construction of Cabinet

The cabinet, shown in vertical section in Figure 1 and in horizontal section in Figure 2, consists of a vapor-tight jacketed cylindrical container, *V*, with a conical bottom and top. The chamber is made of No. 22 B. & S. gage Monel metal. The annular spaces and lid, *W*, are insulated with loosely packed rock wool or glass wool. Fourteen feet (420 cm.) of 0.25-inch (0.6-cm.) copper tubing are bent into a spiral and tacked uniformly around the bottom of the cabinet chamber. The top of the spiral tubing is bent abruptly downward in the central part of the cabinet with its orifice at *N*. An overflow tube, *O*, is used to keep a constant water level in the cabinet as shown by the horizontal dotted line. A wooden support, *U*, is used. The cabinet is mounted in a 0.5-inch (1.25-cm.) plywood container. The heating flask, *Q*, is a 2-liter round-bottomed Pyrex flask in an oil bath, *S*.

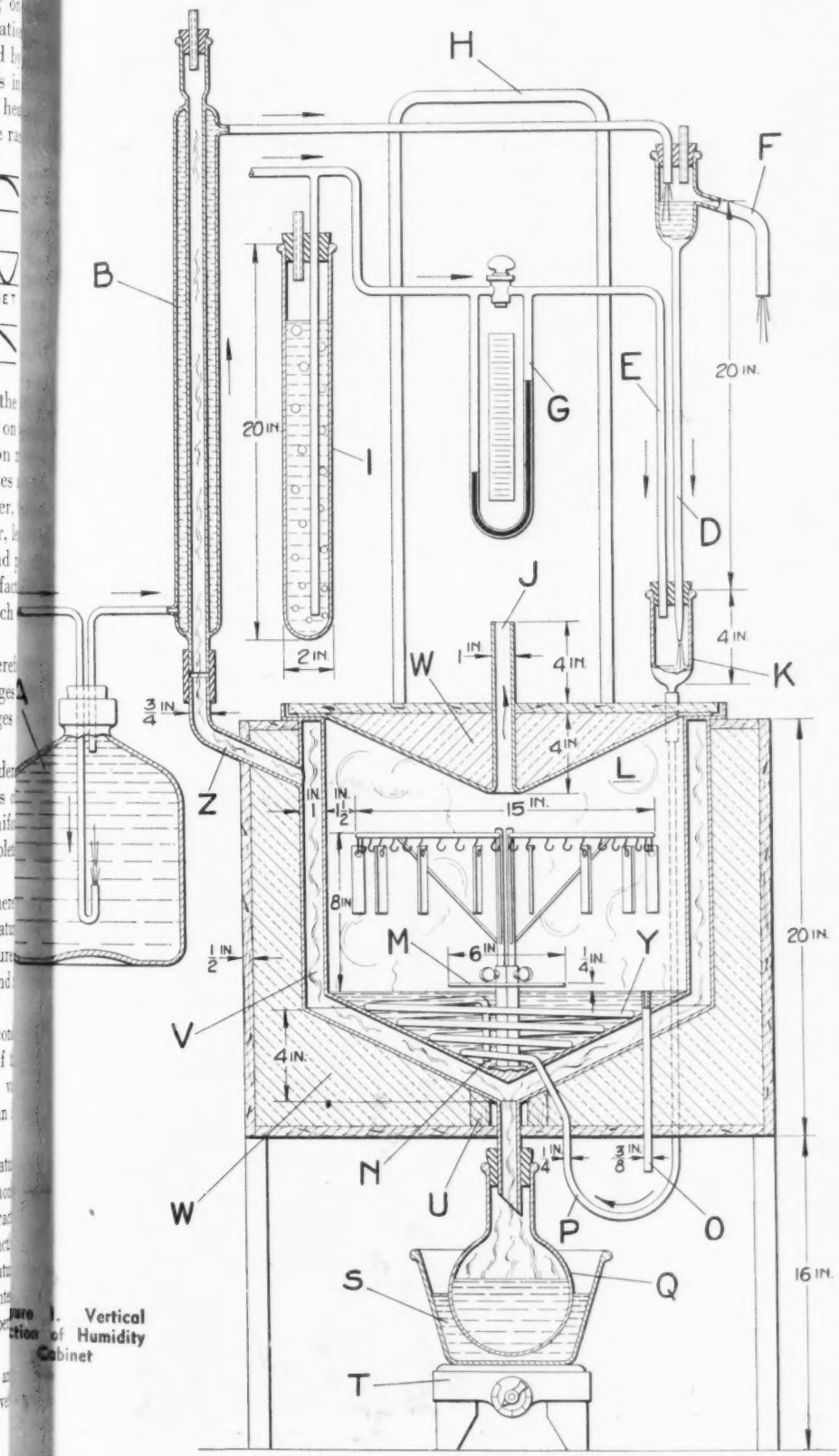


Figure 1. Vertical Section of Humidity Cabinet

The test panel supports consist of 4 concentric rings which are divided into quadrants. Each quadrant is a separate unit and may be removed separately for panel inspections. Each quadrant slides into its own vertical support sleeve which is fastened to the center bottom of the cabinet chamber. Panel hooks of No. 16 B. & S. gage Monel metal are spaced 0.625 inch (1.58 cm.) apart on the concentric rings. This allows approximately 50 hooks per quadrant or 200 hooks for the entire cabinet. Experience has shown that the use of these metal hooks instead of glass hooks causes no perceptible corrosion at the point of contact between the panel and the metal hook. The concentric rings to which the panel hooks are supported consist of 0.125-inch (0.3-cm.) Monel metal rod. A baffle plate, *M*, consists of a circular piece of No. 22 B. & S. gage Monel metal and is fastened to the panel support sleeves 0.25 inch above the surface of the water level as determined by the overflow tube, *O*.

Sedimentation bottle *A* has a capacity of 5 gallons (19 liters). Reflux condenser *B* is fairly long with a 0.75-inch diameter inner condenser tube. The top of the condenser is partially closed to decrease loss of the volatile solvent (cyclopentane for b.p. 120° F., acetone for 136°, etc.) by diffusion into the air. The air regulator and safety tube, *I*, is a large 2 × 20 inch glass tube. *G* is an ordinary calibrated flowmeter. *D*

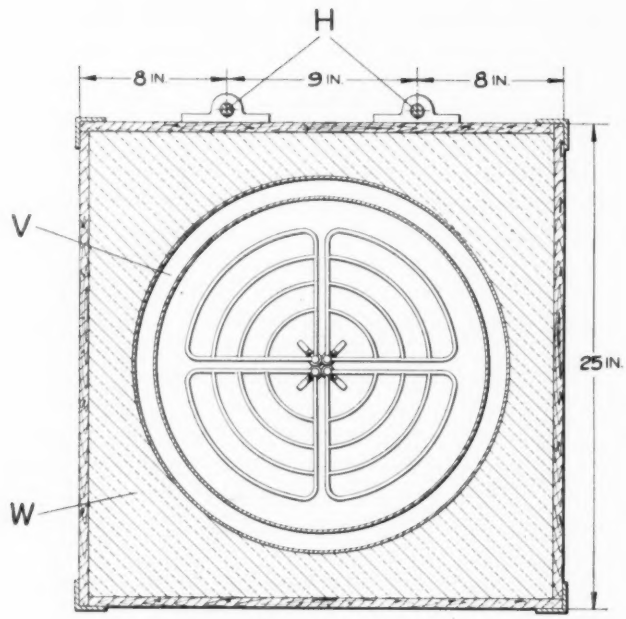
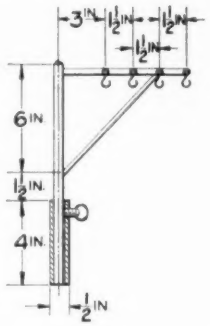


Figure 2. Horizontal Section of Cabinet



is a water-pressure regulator which operates under a constant hydrostatic pressure equivalent to 22 inches. The lower end of this tube is drawn down to a fine capillary, so as to admit a fine stream of water into tube *K*. *H* is an iron support fastened to the back of the humidity cabinet container and is used to hold the control instruments, *B*, *I*, *G*, *E*, and *D*.

Figure 3 is an inside view of the cabinet, taken from above. Figure 4 shows the complete instrument, in operation.

Operation of the Cabinet

The cabinet is filled with water to the top of *O*. (Care must be exercised to wash the cabinet thoroughly to remove acid soldering fluxes before using.) This water and the walls of the cabinet are heated by means of the hot vapors rising from *Q*, at such a rate as to produce slight refluxing in condenser *B*. Because of the good insulation around the cabinet the "low heat" of a small hot plate, *T*, was found to be sufficient.

The humidity in the cabinet is maintained by admitting an excess of water into sedimentation bottle *A*. This bottle allows fine particles of dirt and rust to precipitate, so as not to plug the fine orifice at the bottom of *D*. The water on leaving *A* is used for cooling condenser *B*, then passes into the water pressure regulator, *D*. The excess water is allowed to escape by way of tube *F* to the drain. Water is then automatically admitted at a slow constant rate into mixing tube *K*.

An excess of air is admitted into air-pressure regulator tube *I*. The flowmeter, *G*, is calibrated to allow air, equivalent to 4 times the volume of the humidity cabinet, to pass through tube *E* per hour. The excess air is allowed to escape at the top of tube *I*. This air-pressure regulator tube will keep the rate of air flow into the cabinet constant regardless of relatively wide variations in laboratory or plant air pressures.

The metered air and water in tube *K* descend and the bottom of the cabinet at *P*, then travel a long spiral path through the submerged copper tubing. this passage the air is preheated and prehumidified same conditions as the humidity cabinet before it e at the orifice in the center bottom of the cabinet at air then rises vertically through the water in the of the cabinet and finally emerges at the surface the baffle plate, *M*. This baffle plate breaks all air and in so doing prevents the water spray from the b air bubbles from falling onto the test panels. It also to distribute the emerging air in a uniform manner th out the cabinet and thereby prevent air channeling.

The exhaust air is allowed to escape through a chim which also serves as the handle for removing the lid underside of the lid is conical, so as to allow small a of water condensing on the lid to return to the bottom cabinet by way of the center. In this way the test will not be wet by water drops.

When the panel supports are removed for inspecti test panels, the lid should be replaced as promptly a sible, if a very volatile heating medium is used. Any ciable drop of temperature inside the cabinet will air entering the jacket, and to consequent increase in oration losses. These, however, are very moderate, with the very low boiling cyclopentane (120° F.) the loss is less than 1 pint weekly.

Test panels were suspended in different parts cabinet to check its uniformity; regardless of wher were suspended the corrosion was the same. Further because of the uniformity of the corrosion effects found that 1 × 3 inch test panels could be used with fully as reliable as those obtainable with the usual inch test panels. These smaller test panels permit siderably larger testing capacity.

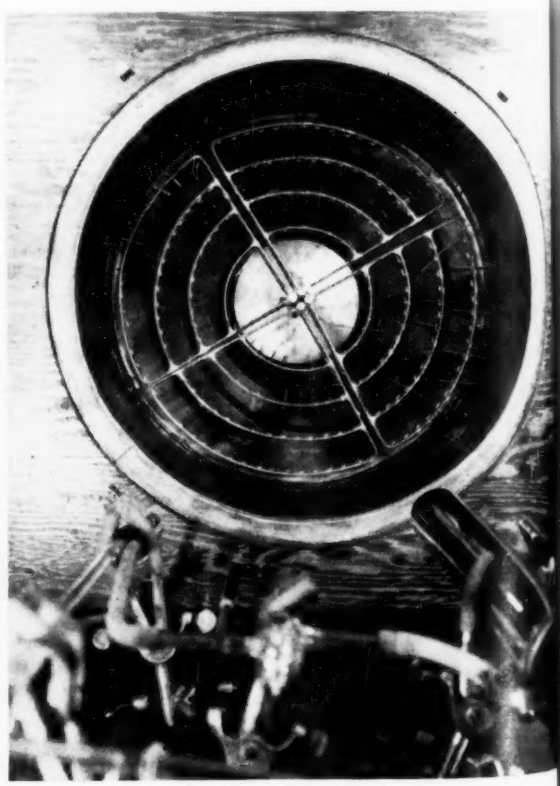


Figure 3

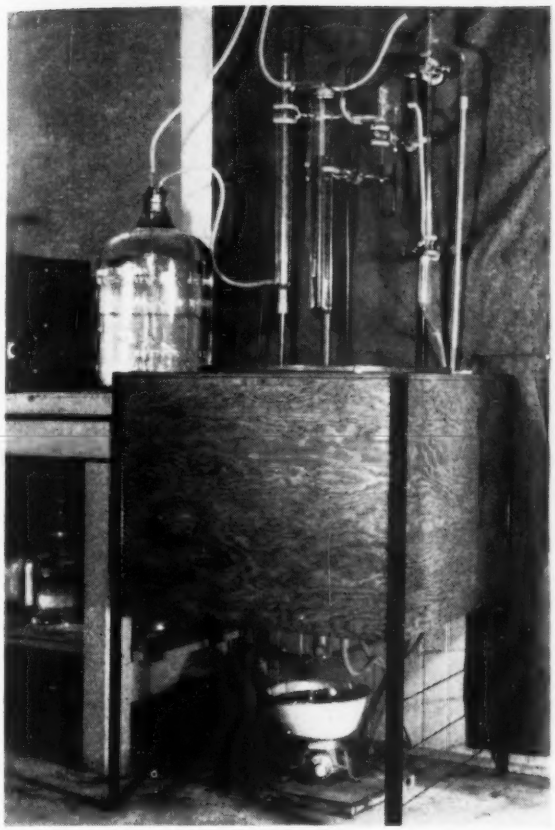


Figure 4

Table I illustrates differences in performance between the present cabinet and a cabinet of the conventional type.

Both cabinets were operated at 120° F. and 100% relative humidity. In the conventional cabinet moisture frequently condensed on the panels, and dripped down from them. In the cabinet here described some condensation took place when the cold panels were introduced into the cabinet. This initially condensed water remained as a dew on the panels, since evaporation could not take place at 100% relative humidity, but there was no continual condensation, nor any flow of water over the surfaces of the test panels.

The panels used in the test were prepared as follows: Test panels of 1 × 3 inches of S.A.E. 1025 sheet steel B. & S. gage 24 were cleaned by washing in benzene and wiping dry with a clean cloth. Completely new and uniform surfaces were exposed on the test panels by carefully buffing on a cloth buffing wheel (6 inches in diameter × 2 inches thick) coated with an abrasive, such as No. 300 grit Carborundum composition. Care was taken during this buffing operation to remove all sharp burrs at the edges of the test panels. The test panels were again wiped with a clean cloth to remove any traces of polishing grit and were then used. Care was taken not to touch the prepared test panels with the fingers.

All determinations were made in triplicate, and the figures shown are the average values. The variations of the triplicate determinations were within a range of 10% for the new cabinet and 28% for the conventional cabinet.

The fundamental difference between the cabinets is most clearly apparent from the two last items in the tabulation. If rust preventive "Q1" in its experimental stage had been evaluated on the basis of the conventional cabinet alone, it would have been discarded as no more effective than the sodium sulfonate or a fatty acid solution, and only half as effective as the older rust preventive "Q2".

Thus a product highly meritorious in its field of application would have been discarded.

However, the test in the new cabinet showed it to be at least 7 to 10 times more efficient than the petroleum sulfonate or the fatty acid, and at least 3 times more efficient than Q2, under conditions resembling ordinary factory storage, where a frequent flow of water over the surfaces of objects stored is out of question.

Corrosion resistance is a complex phenomenon, and a corrosion preventive which is better under certain test conditions is inferior under other test conditions, and vice versa. The same is true of actual storage under practical conditions.

A corrosion preventive which is most potent in actual use where continuous condensation of humidity takes place may be far from the optimum for storage in even extreme humidities without actual condensation; and a corrosion preventive which is best for the corrosive but not extremely humid atmosphere in steel plants is not best for storage under tropical conditions which are characterized by high temperature and humidity but where corrosive fumes are absent. A detailed analysis of the factors entailed would take us beyond the frame of the present subject; suffice it to say that any accelerated corrosion test must be adapted to the natural conditions in view. The cabinet here described will give an accurate reproducible measure of storage resistance under indoor conditions, in the absence of continuous precipitation or of corrosive vapors. The influence of these latter factors should be measured separately where they play a part, and should not be introduced where they do not enter into the applications envisaged.

TABLE I.—CABINET PERFORMANCE

Material Tested	Time Required for First 3 Rust Spots to Appear on Surface of Iron Panels	
	Conventional cabinet	New cabinet
	Hours	*Hours*
Blank	10 min.	25 min.
Paraffinic mineral oil S.A.E. 40	4	7
10% butyl ricinoleate in Stoddard solvent	24	60
10% methyl oleate in Stoddard solvent	24	80
10% wood resin in Stoddard solvent	28	65
20% sodium (petroleum) sulfonate in Stoddard solvent	120	236
10% oleic acid in 40 viscosity mineral oil	144	328
20% commercial rust preventive Q1 in Stoddard solvent	120	No corrosion in 2624 hours
20% commercial rust preventive Q2 in Stoddard solvent	240	840

Acknowledgment

The author takes this opportunity to express his sincere appreciation for the interest and cooperation which Johan Bjorksten, chemical director, Quaker Chemical Products Corporation, has given in the preparation of this paper.

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A High pH Indium Cyanide Bath

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Introduction

WITHIN recent years there has been considerable interest shown in the electroplating of indium. The chemistry and history of the metal has been described by Downes and Kahlenberg[1] and by Murray[2]. Gray[3] disclosed the first practical indium cyanide bath stabilized with glucose or glycine. A number of baths of this type have been covered by United States patents[4]. Today the most commonly used indium cyanide bath is stabilized with dextrose[5]. In 1942 C. E. Smart[6] revealed in a patent the plating of indium from a caustic bath using dextrose.

Since the electrochemical properties of indium are similar to cadmium, as Thompson[7] has pointed out, it was thought that the addition of caustic to the cyanide bath might improve the properties. With this thought in mind, a laboratory scale investigation was undertaken.

Experimental

The preparation of bath number nineteen is as follows and is typical of the procedure used for baths containing both cyanide and caustic:

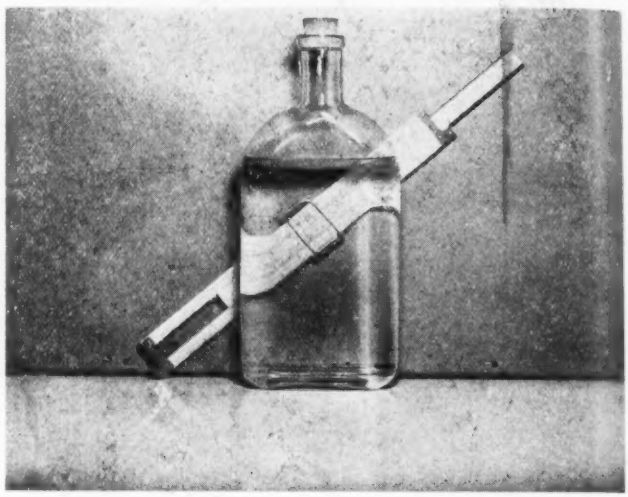
Eighteen grams of indium metal were dissolved in 80 milliliters of concentrated hydrochloric acid and evaporated to a low volume on a steam plate. The solution was cooled, 30 grams of dextrose added and diluted to 100 milliliters. 160 grams of potassium cyanide and 40 grams of potassium hydroxide were dissolved in 350 milliliters of water. The cyanide-caustic solution was agitated vigorously and the indium-dextrose solution was rapidly added. The resulting solution was almost colorless.

Three days after the bath was prepared, the cathode efficiency was 84 percent. Seven months later and after considerable use, the cathode efficiency was 34 percent. The bath was then light yellow in color and contained a trace of precipitate.

It is not necessary to make baths by starting with indium metal. Commercial indium chloride is excellent for this purpose and was used to prepare many of the baths.

The experimental baths listed in the accompanying table, which were studied for cathode efficiency and bath stability, were under observation for a period of three weeks.

All current efficiency measurements were made at 20 amperes per square foot. The results in general indicated that:



A 10-liter bath used for occasional laboratory work over a period of one year with several adjustments of the KCN and KOH during this period.

1. For certain ratios of cyanide to caustic, only a trace of precipitate is formed.
2. The cathode efficiency increases with increase in indium concentration.
3. Dextrose in quantities equal to the indium content of the bath appears to be beneficial.
4. In general, the cathode efficiency is high in the baths which exhibit a minimum of precipitate.
5. The best results are obtained at a pH of about 11.

Discussion

The high pH cyanide-caustic indium baths have greater stability than the cyanide bath. Omitting the effects of ionization and of dextrose, the soluble compounds obtained may be represented by the formulas $KIn(CN)_4$ and $KIn(OH)_4$. The complex salts would tend

(*Concluded on page 77*)

	Grams Per Liter						Cathode	Bath	Amount		Ml. Total
Bath No.	In	NaCN	NaOH	KCN	KOH	Dext.	Efficiency	Color	Precipitate	pH	Volume
1.	33	99	22			17	38	Red	S*	11.4	450
2.	33	102				17	31	Dk. Red	M	10.1	470
3.	34			142	29	29	71	Yellow	T	10.9	35
4.	16			133	33	16	45	Colorless	T	12.0	300
5.	30		60			22	5		L		100
6.	33			60	30	20	36	Yellow	T	13.1	100
7.	33			90	20	20	94	Brown	T	10.0	50
8.	33			40	40	20	10		S		50
9.	33			160	20	20	94	Dark	M	10.5	50
10.	33			20	80	20	3		L		50
11.	33			120	10	20	99	Dk. Red	M		50
12.	30			120	10	15	98	Dk. Red	M	9.9	330
13.	15			120	10	15	70	Dk. Red	M	10.3	165
14.	15			93	7	15	61	Dk. Red	S	10.6	165
15.	33			160	30	15	96	Cloudy	S	10.9	40
16.	33			160	30	15	94	Yellow	S	10.9	100
17.	33			160	30	30	87	Yellow	T	10.9	100
18.	30			160	30	20	74	Sl. Yellow	T	10.9	100
19.	18			160	40	30	84	Sl. Yellow	T		1000

* L, M, S and T mean large, medium, small and trace.

Metallizing Non-Conductors

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PART VI

Gold Films

The fundamental process for forming films of gold is to make an aqueous solution of gold chloride, either neutral or slightly alkaline. The reducing agents as in the case of silvering are alcohol, glycerine, invert sugar, glucose, citric acid, formaldehyde, etc.

Gold mirrors always have had a special attraction both for scientists and mirror makers. In by-gone times, magical properties were attributed to them. Even today, they are the criteria of excellence. Their practical value lies mostly in their application to decorative and advertising purposes, where the chemical method of depositing gold very often not only gives better results, but is also considerably cheaper and simpler than the use of gold leaf. Other uses are for optical reflectors, where the use is very limited, and as a conducting film.

Gold mirrors were produced as early as 1835 by Petitjean by precipitating out the gold on the glass surface with a solution of sodium tartrate. Nearly at the same time, Prof. von Liebig published a procedure for forming gold mirrors on glass. The process outlined is crude and difficult to employ, and so will not be described here. Bauer referred to the use of hydroxylamine as a means for precipitating films of gold on glass, but gives no details. Reference was also made to the use of formaldehyde as a reducing agent.

Daly deposited films of gold on dentures of "vulcanite" by placing the latter in a 20% solution of gold chloride to which has been added potassium sulphide and a suitable reducing agent such as oxalic or tannic acid.

Boirre gilded glass by first treating it with a mercury salt such as mercuric chloride, subsequently pouring a solution of gold chloride thereon. After a satisfactory gold film had formed and dried, it was coated with a suitable varnish.

Coles-Cowper made a paste of tin chloride and a binder, such as jewelers rouge, which was rubbed over the surface and then removed. The glass treated with this compound was then mersed in a gold bath made up of:

Gold chloride	1%
Caustic soda	7%
Glucose	5%

Pratt formed a silver-gold alloy on glass by first washing the surface and then treating it with tin chloride and again washing, subsequently treating with a gold chloride solution containing caustic soda and glycerine, again washing and treating with a silvering solution containing silver nitrate precipitated by ammonia and redissolved to which was added Rochelle salts, the solution being poured on the gilded surface. After it was dried, the surface was varnished.

Von Angerer gave the following formulation for forming gold films:

Solution No. 1

Water	1½ gals.
Gold chloride	1 oz.

Solution No. 2

Potassium carbonate	8 ozs.
Rock candy	1 oz.
Water	1½ gals.
Formaldehyde	3 drams

The solutions are filtered and mixed just before use.

Draper described a method by which a film of silver may be partially converted into a gold film by immersing the silvered mirror in a bath of gold chloride. The Bureau of Standards attempted to reproduce these results but did not succeed in producing satisfactory reflecting surfaces by this method.

Pratt first "*tinned*" glass surfaces as in the customary silvering method, at 150 to 200° F. thereafter treated with:

Solution No. 1

Gold chloride	3 parts
Water	40 parts

Solution No. 2

Sodium hydroxide	1 part
Water	20 parts

Solution No. 3

Glycerine	1 part
Water	1 part

To the foregoing solution was added several drops of a mannite solution.

Andres formed the gilding solution from:

Solution No. 1

Gold chloride	1 oz.
Water	32 oz.

Solution No. 2

Sodium carbonate	1 oz.
Water	8 oz.

Solution No. 3

Formaldehyde	1 oz.
Water	16 ozs.

Solutions No. 2 and No. 3 are mixed and to this are added from 1 to 5 grams of basic mercuric salicylate.

The last named mixture is mixed in equal portions with solution No. 1 and poured onto the given surface. The inventor showed a spray in which both solutions are simultaneously emanating from a common source and onto the given surface.

Loiseleur treated the surface with a silver solution and thereafter with:

Gold nitrate	2.0	grams
Glucose	0.25	"
Levulose	0.25	"
Sodium tartrate	0.025	"

at about 40 to 50° C. After drying, the gold deposit is capable of receiving a fine polish under the action of a soft leather.

One of the formulas often mentioned and recommended is that accredited to Prof. Boettger, and is made up of:

Solution No. 1

2 gram gold chloride (50-51%), dissolved in 120 cc. water.

Solution No. 2

6 grams sodium hydroxide, dissolved in 100 cc. water.

Solution No. 3

2 grams glucose dissolved in 24 cc. water and added to 24 cc. alcohol (80%) and 24 cc. formaldehyde.

For gilding, the following proportions of the foregoing solutions are used:

Solution No. 1	64 parts
Solution No. 2	16 parts
Solution No. 3	1 part

The formula, if carefully handled, works well. It is found, however, that neutralization with sodium hydroxide is rather difficult, as the slightest excess increases the sensitivity of the solution towards the reducing agent in such a way that lumps of gold scum are built within the solution before gold crystals settle on the glass. The substitution of sodium carbonate for sodium hydroxide helps a great deal in this respect. It permits, at the same time, simplification of the reducing solution No. 3, using a dilute solution of formaldehyde only. The following formula represents this type:

Solution No. 1

3 grams gold chloride (50-51%) dissolved in 80 cc. water.

Solution No. 2

8 grams sodium carbonate dissolved in 80 cc. water.

Solution No. 3

5 cc. Formaldehyde (40%) diluted with 80 cc. water.

For gilding, equal parts solutions No. 1, No. 2 and No. 3 are used.

This formula, as well as the previous one, uses an extraordinary high concentration of gold chloride, such as 1 gram in 80 parts of the final solution; that is a concentration of 1.25 percent; whereas the strength of an ordinary silvering solution is about 0.3 percent on the average. That would exclude the use of these formulas for practical purposes, because of the high price of gold chloride. It is, however, possible to use the formulas in such a dilution with water that their concentration is only about 0.1 percent. The strength necessary depends, as we shall see, on how the solutions are used.

The application of the gold solution is similar to the methods of silvering. The glass, which is carefully cleaned, is first washed with the solution of tin chloride ("tinned"), using a somewhat stronger concentration than usual, then washed with water, and, while still wet but with as little wash water left as possible, is treated with the gold chloride solution. This treatment can be done in three different ways: (1) the gold solution is poured on and allowed to stand on the glass plate for about 20 minutes. The concentration may be 0.2%. (2) glass is rocked in a bath of the solution, the concentration being about 0.1%. (3) the solution is sprayed against the glass, for which purpose the solution must be highly concentrated, as much as 1.25%. The best temperature for the first two methods is about 25° C. (78° F.), whereas, in the third method the temperature may be raised to about 30° C. (86° F.).

If the solutions are well balanced, their mixtures will remain clear for most of the reaction time. In the latter stage of the process, the solution becomes grayish-blue in appearance. The gold film settles down first as a thin, bluish veil, gradually getting thicker and a darker blue. It is not necessary that the film become completely opaque or even golden, although it turns out to be so in the later stages. But the reflected light must show a golden, or rather brown tone. The glass is then carefully and thoroughly washed with water without touching it with the fingers. It is very rarely that the film adheres closely enough to the glass to be directly protected by varnish and paint. As a rule, the thin gold film must be protected by a layer of silver applied immediately after the washing in the usual way of silvering. Then the glass is dried and varnished or painted. La Hodney used such mirrors for non-glare purposes.

A series of organic and inorganic gold compounds having properties that precipitate out of solution by various precipitants, and having possibilities for gold mirror making, are described by Gibson; Gibson and Colles; Gibson and Simonsen; Gibson and Pope; Gibson and Buraway; Gibson, Buraway and Holt; Gibson, Buraway, Hampson and Powell; and by Kharasch and Isbell.

Ballard described test methods for ascertaining the thickness of gold films fired on ceramics.

Lead Sulphide Films

Lead sulphide films are used as "anti-glare" mirrors in automobiles and are commonly referred to in the mirror industry as "gun metal" types. They are also used as high resistance elements in radio and other electrical circuits.

The basic process according to Hauser & Biesalski, is as follows: an aqueous solution of lead nitrate, acetate or tartrate is mixed with an aqueous solution of thiocarbamide (thiourea) in the presence of an alkali whereupon a film of lead sulphide will precipitate out on the glass. First, there is prepared:

Thiourea	1 g.
Water	50-75 ml.

To the foregoing solution is added:

Lead acetate solution	50-75 ml.

and finally:

Potassium or ammonium hydroxide solution	25 ml.

Immediately the white lead hydroxide, which first forms, becomes dark and, after a short time, is converted to black lead sulphide, and a firm, uniform film throughout. This is now washed with running water and dried.

A modification of the foregoing is accredited to Peacock, who likewise uses three solutions, viz:

Solution No. 1

Lead nitrate	2 oz.
Water	32 "

Solution No. 2

Caustic soda	4 oz.
Water	32 "

Solution No. 3

Thiourea	2 oz.
Water	48 "

If cold deposition is to be employed, then use 1 part each of solutions No. 1, No. 2 and No. 3. On the other hand, if faster deposition is desired on the glass, the temperature should be increased, and the following proportions are used:

Solution No. 1	1 part
Solution No. 2	1 "
Solution No. 3	1 "
Water	4 parts

Colbert and Colbert recommended the following process, also requiring three solutions:

Solution No. 1

Lead acetate	1 oz.
Water	24 "

Solution No. 2

Caustic soda	2 oz.
Water	32 "

Solution No. 3

Thiourea	1 oz.
Water	48 "

Four parts of solution No. 3 and 1 part of solution No. 1 are mixed. Thereafter solution No. 2 is added to the foregoing mixture in the proportion of 1 part of solution No. 2 to 5 parts of combined solutions No. 1 and No. 2.

Reynolds and Reynolds and Grubb formed films of lead sulphide in the following manner:

Solution "A"

Water	1 liter
Thiourea	15 grams

Solution "B"

Lead tartrate	75 g./l.
Caustic soda	40 "

Lead tartrate is made by adding a solution of Rochelle salts to a solution of lead acetate or nitrate. It must be freshly precipitated for use in the formula.

Varying the proportions of solutions "A" and "B" will give rise to a transparent, translucent or opaque film of lead sulphide on the glass surface. The best results are obtained if the solution is kept at 140° F.

Herewith follows, by way of illustration, the concentration of four different solu for forming lead sulphide films:

	"A"	"B"	"C"
Lead nitrate or acetate	0.5	2.0	4.2
Thiocarbamide	1.0	2.0	2.1
Sodium hydroxide	0.6	2.0	6.2

Other concentrations may be found u or even better for the purpose. That dep greatly on the temperature, which is taken at 20 to 25° C. (68 to 78° F.).

A simplified variation of the foreg formulation is made up of:

Thiourea	1 gram
Water	50-75 cc.

To this is added 50 to 75 cc. of a di solution of lead acetate and finally 25 of a dilute solution of potassium or sod hydroxide (or ammonia solution) is ad mixing continuously.

Nickel Films

Nickel carbonyl was proposed by Fink Knight as a basis for forming metallic nic films on the inner walls of a Dewar o called "vacuum flask" (Thermos bottle)

The nickel carbonyl is poured onto given surface and, at 150° C., is decompo to form carbon monoxide and metallic nick the latter being deposited in an adher film on the surface upon which the solut was poured. If the surface is smooth a polished, the resulting deposit of nickel also have a polish, and this latter will crease with the thickness of the deposit, might be expected. On to this film metallic nickel may be deposited any ot metal, without any preparation whatsoe

A serious objection to the use of nic carbonyl is the fact that it is so poisonous

Lang formed nickel films by evaporat nickel carbonyl on the warmed glass pla in the presence of carbon dioxide. Su sequently films of rhodium may be depos on it.

Von Liebig precipitated out nickel fil in the same fashion as he did his sil mirrors, using an alkaline solution of nick sulphate and tartrates as the reducing age No details are given in his patent descripti

Antimony Films

In order to form a deposit of bright meta lic antimony on glass, Loiseleur suggest the following solutions:

Solution No. 1

Antimony trichloride sol'n	Sp.g. 1.38

Solution No. 2

Tartaric acid	60 g./L.
Caustic Soda	48 "
Ammonia (20%)	160 cc./L.

Solution No. 3

Rongalite	153 "

Solution No. 4

Iron ammonium sulphate	255.48 g./L.
Formaldehyde (35%)	65.17 cc./L.

Cathode Sputtering

The deposition of or formation of metall films, alloys or metalloids on a given surface by the so-called cathode sputtering method not one for the average electro-plater, pr

marily because the equipment used to deposit the films requires trained and skilled persons familiar with this sort of equipment.

A flat surface, such as a steel plate with a hole in it, is necessary. On this metal plate is placed a glass bell-jar. An evacuating system is used, consisting of a mechanical pump backed up with a mercury aspirator, or, better yet with the modern types of oil pumps. The evacuating system is usually found underneath the table holding the metal plate with the glass bell-jar, and connected through a glass tube from the evacuating system through the metal plate. Such a system was discussed by Wein.

Applications: The metal films deposited by the methods described in the present series of processes have academic, technological and commercial uses, and are not to be compared with such methods as was described by processes already discussed. Among the chief uses are:

Reflectors for astronomical and technological purposes, as well as color photographic cameras.

Spectrometers, interferometers and similar devices.

The fine quartz fibers used in galvanometers are made conductive (electrically) by such methods.

Photo-cells of the barrier type using the front surface as a conductor make use of this process.

Gold is deposited on master records and a shell of copper subsequently electroformed thereon for the manufacture of phonograph records.

Gold films on Duralumin diaphragms in microphones.

Electrical contact for piezo crystals (oscillators).

Contacts for electrical resistor units.

The formation of metallic films by cathode sputtering methods have their advantages as well as disadvantages, just as other methods of forming films, and, it is well that we consider them now:

Advantages: Extremely thin films may be formed, so thin in fact that they may be used as optical filters and at the same time serve as electrical conductors as, for example, in the barrier layer types of photo-cells.

Metals that ordinarily cannot be precipitated out of solution can be deposited on any sort of a surface.

Materials can be coated with metals by these methods which could not be coated if high temperatures or chemically destructive compounds were required, as in some other processes.

Alloys and elements such as tellurium, silicon and selenium can be deposited on any given surface in very thin layers.

One metal can be deposited on another far removed from it in the electrochemical series, whereas this is impossible by electroplating. For example, gold or platinum can be deposited on aluminum or magnesium.

Disadvantages: The processes are comparatively slow and tedious.

The deposits are not made conveniently.

The processes are applicable only to comparatively small pieces.

Cathode Sputtering: This method is about the first of the known methods used for depositing metals on a given surface in a vacuum chamber, and is accredited to Grove. His method was to apply a high voltage between the anode and the cathode, the latter was seen to disintegrate and deposit itself on the glass wall of the evacuated chamber and on the work itself. This method is rarely used today, simply because it requires such high voltages and because it requires more exacting conditions to get a satisfactory film. Gardner and Case describe such equipment.

Distillation: Under this heading there are three distinct methods of distilling metals and allowing them to condense on the surface with which the metal film is to be an integral part.

(1) Thermal Evaporation: This specific process may be divided into two groups, and they are (a) the method which makes use of a vessel containing the metal to be distilled. When the proper temperature has been attained, the metal will begin to distill. The other process (b) is one in which a filament of carbon, molybdenium or tungsten wire is suitably fixed in the vacuum chamber. On the filament is placed small pieces of the metal to be distilled. If a current is passed through the filmaent, it will get hot, heating the metal pieces placed on the filament, and these metals will be distilled. See Sommer, O'Brein, Sukumulyn and Burkhardt and Reinecke for references dealing with the "a" method, and for references dealing with the "b" process see Edison, Zworykin, Trautman, Saeger, Edwards, Williams, Alexander, Gardner, Walker, Burkhardt and Reinecke, Siebertz, Lenz, Henderson, and Pfund.

(2) Arc: The metals to be distilled are in the form of pencils or rods, are brought together to form an "arc." Obviously, of course, the potential should be sufficiently high between the electrodes to form the arc, and the metallic vapor will soon be seen to distill and condense on the inner wall of the evacuated chamber and objects within that chamber. A source of potential can be connected between the "work" and the "cathode" to "pull the metallic ions to the anode" during the distillation process. This process is similar to the carbon arc so commonly seen in motion picture projectors and in street lighting methods, with the exception that the arc is maintained in a vacuum chamber.

(3) Eddy Currents: The metals to be distilled are distilled by means of high frequency current, and the metal may be in the form of coarse pieces, such as granules, or in the form of a compound of the metal, so that when properly heated the metal will be distilled off. These methods were patented by Case and Macksoud.

Metal Spraying

The present group of processes has for its object spraying of a molten stream of metal, much in the same fashion as one does in the case of lacquers.

Hall classifies the methods of spraying metals into three main groups, this classification being on the basis of whether the metal is fed to the spraying apparatus in the form of a wire, powder or in a molten form. Each of these methods uses a specially designed pistol or gun and commercial versions of these are available from their respective manufacturers.

The wire pistol is based on that originally developed for the Schoop process. The method can be applied virtually for any metal obtainable in wire form. Usually, the higher the melting point of the wire, the smaller the diameter employed in the gun. Diameters of 1.0 and 1.5 mm. are the usual standards, but larger sizes are also used. Again, the small diameters would be used when spraying small areas and larger diameters for large surfaces.

In the powder type of gun as developed by Schori, Ltd., the method is applicable to any metal that can be obtained in fine powder form.

The molten liquid type of gun has been developed by several firms and can be used with metals whose melting points are not high, since high melting point metals affect the metal components of the gun and soon make it unfit for use.

The wire type of gun requires the metal spraying pistol itself, wire supply, compressed air, oxygen and fuel gas, compressed gas accessories, such as valves, regulators, etc. The wire is fed into the pistol in the form of a wire of a uniform diameter from a spool, reel or drum. This feeding of wire is done by means of a small air turbine, reduction gears and knurled gripping rollers, thus feeding it to the melting nozzle of the pistol. In the nozzle of the pistol is affixed a flame which is maintained by means of oxygen and compressed coal gas, hydrogen or other combustible gas such as propane, butane or acetylene. The supply of these gases is accurately controlled by regulating valves and pressure gauges, the relative quantities being determined by the composition of the wire, its melting point and diameter. The metal, as fast as melted, is atomized by means of compressed air and carried forward to the work, a distance of 3 to 6 inches away. The wire pistol thus houses the turbine wire-feed mechanism, the nozzle at which melting of the wire actually occurs, the feed system for compressed air to the turbine and for atomizing and propelling the spray, and the feed system for the oxygen and fuel gas. It is compact and well balanced.

The outstanding difference of the Schori gun and system is in the method of feeding the powder to the hot nozzle. The powder is fed from a reservoir by injector principals into the gun. Start-stop is controlled by the thumb of the hand holding the pistol covering or uncovering an orifice.

The molten metal type of gun, like the powder gun has no moving parts for feeding the metal. The molten metal is ladeled into the malleable-iron container of the gun and maintained there at the correct temperature by means of a burner which is an integral part of the gun and which operates with compressed air injection on the Bunsen type of burner.

The films of metals formed are non-uniform and coarse, and thick.

(*References appear on page* 76)

THIS IS WASHINGTON—

By George W. Grupp
METAL FINISHING's Washington Correspondent

Baltimore-Washington Branch Has Record Breaking Meeting The January meeting of the Baltimore-Washington Branch of the A. E. S., which was held in Baltimore at Marty Walsh's restaurant, was the greatest meeting in the history of the Branch. Maurice Caplan of Baltimore is now the holder of the Branch's attendance prize money. With imagination and hard work he established an all-time regular monthly meeting attendance record. There were 81 present for dinner and a total of 85 attended the educational program.

Chemical Coloring and Superimposed AC Discussed in Baltimore Mr. Sidney Boyar, research chemist of the Frederick Gumm Chemical Company of Kearny, N. J., read two informative papers: (1) "Chemical Coloring of Magnesium Alloys" and (2) "The Electrodeposition of Metals With Superimposed Alternating Current." Both papers were written by Mr. Robert R. Sizelove of the Frederick Gumm Chemical Co., but he was unable to deliver them in person because of illness. Mr. Boyar read these papers with great skill in spite of the surrounding difficulties. He stood behind the restaurant's bar, with the bartender rushing around him to mix drinks. To the mirth of those present the bus boy dropped a box full of tableware at Mr. Boyar's heels. Without batting an eye he kept on reading. And then to add to his difficulties he had to compete against the restaurant's orchestra which was going full blast on the floor above. When he finished the reading of the papers, which he illustrated with a number of charts, he stood up well against a barrage of questions.

Research Committee Members Appointed President Ken Huston appointed three additional members to the Baltimore-Washington Branch's research committee. They are Maurice Caplan and L. G. Tubbs of Baltimore, and Dr. Abner Brenner of Washington.

Baltimore-Washington Branch Issues Roster and History About the first of February the Baltimore-Washington Branch of the A. E. S. is to issue a roster of its members together with a brief history of the Branch. This booklet will be used to help members to become better acquainted with each other and stimulate members to aid in increasing the membership of the Branch.

Stump the Experts Meeting to Be Held in March The "stump the experts" meeting of the Baltimore-Washington Branch will be held in Washington in March. The panel of experts will consist of Dr. William Blum, Wendell Barrows, and Fred Pierdon of Washington, and William Bresnick and Albert G. Taylor of Baltimore. One dollar will be paid for each question the experts cannot answer. After the educational session the members of the Branch will discuss the subject of metal finishing apprenticeship courses, research which would be beneficial to the industry, and a proposed amendment to the A. E. S. constitution to provide a permanent research committee.

Branch Contemplates Buying Amplifying Equipment To overcome the bad acoustics which are sometimes encountered in the restaurants where the meetings of the Baltimore-Washington Branch are held, Fred Pierdon is determined that the Branch should buy or rent portable amplifying equipment. This suggestion has met with favorable comment from all those who recognize the difficulties the guest speakers labor under when trying to deliver themselves of their papers in restaurants whose acoustical properties are poor. The use of amplifying equipment, it is believed, will make the meetings more interesting to those who are sitting in the back rows.

Platers May Not Get Equipment Without Rated Orders Before this appears in print PR-24 may be amended for the purpose of eliminating most of the orders including L-123. This means that platers will no longer be able to apply to suppliers for equipment without a rated order. This action may be taken because of the pressure of present war needs.

Metal Finishing Classed as an Essential Activity The War Manpower Commission announced on January 16, 1945, that among the essential activities are "enameling, japanning, lacquering, painting, plating, galvanizing, aluminum coating, polishing, rust-proofing of essential metal products; sherardizing; retinning." This will be used as a guide in the induction of men in the 26 through 29 group in accordance with the directive issued on January 15, 1945, by War Mobilization and Reconversion Director James F. Byrnes. And since these activities were rated as "essential" and not as "critical," one may wonder if some employees of platers will be drafted to work in critical activities under authority of the Bailey-May "work or fight" Act which is expected to pass before this is in print.

Gratuities Are Now Forbidden General Order No. 2 of the United States Treasury Department, issued on January 18, 1945, provides that no employee of the Procurement Division is permitted to conduct official business, unless he is given special permission to the contrary, except on Government premises. No employee is permitted to accept any gratuity of any kind either directly or indirectly. The order specially states that they cannot accept such gratuities as tips on the stock market, race horses, free transportation, hotel accommodations or club privileges, tickets to the theatre, or to prize fights, "the use for personal convenience of automobiles, telephones or eating facilities on a courtesy basis of firms doing business with the Procurement Division; and other favors of any nature whatsoever. Such favors may not be accepted during periods of leave or after office hours." The order also asked every employee who receives $2,000 per annum or more to submit a list of all financial relationships he has had with anyone doing business with the Procurement Division. Those who fail to live up to these and other provisions of the order may be dismissed from the service or severe disciplinary action may be taken.

How to Handle Cancellation Order Material Priorities Regulation 1 was amended on January 6, 1945, for the purpose of providing that a manufacturer who has received a cancellation of an order from a customer need not withdraw any extension of the customer's rating that he has used on orders for materials valued at $25 or less. This action was taken by the WPB to eliminate extensive bookkeeping requirements for manufacturers. The amended regulation removes restrictions on the sale of materials that were obtained with priorities assistance and which can no longer be used for the purpose for which assistance was given. If the person is not in the regular business of selling such material and the sale is covered by Priorities Regulation 13, then under such conditions he may sell it in accordance with provisions of that regulation.

Ammonia, Cyanamid and Sodium Nitrate Control Transferred to M-300 Sodium Nitrate Order M-62, Ammonia and Sulphate of Ammonia Order M-163, Synthetic Ammonia Order M-164, and Cyanamid Order M-165 were revoked on December 27, 1944. Sodium nitrate, product ammonia, sulphate of ammonia and cyanamid were placed under the control of Schedule 80 of M-300. Synthetic ammonia was placed under the control of Schedule 79 of Order M-300.

Biddle Reports His Views on Surplus Property Attorney-General Francis Biddle in his preliminary report to Congress, as required by the War Mobilization and Reconversion Act of 1944, emphasized the necessity for surrounding the disposition of surplus goods with certain limiting safeguards. Mr. Biddle pointed out that in many instances Government-owned materials will be the only source of supply for some time for essential civilian consumption. It is his opinion that the return of property to the original manufacturers would prevent access to these materials to small business and that it would discriminate against that portion of industry which is engaged in fabricating and assembling rather than in the manufacture of component parts.

"Buyer's Guide for Surplus Property" Issued By SWPA The Surplus War Property Administration recently issued a booklet entitled "Buyer's Guide for Surplus Property" which may be had from the Superintendent of Documents, Washington 25, D. C., at a price of 10 cents a copy. This booklet tells what materials and articles and property are disposed by the Reconstruction Finance Corporation, the Procurement Division of the Treasury Department, the War Food Administration, the Foreign Economic Administration, the United States Maritime Commission, the Navy Department, the War Department, and the Smaller War Plants Corporation. It gives the addresses of all local offices of the various agencies where prospective buyers can obtain information on the goods for sale and the methods of disposal.

Cadmium Plating Requirements Increase At the January meeting of the Cadmium Industry Advisory Committee officials of the WPB told members of the Committee that increased Army requirements will keep cadmium high on the list of critical metals throughout 1945. Estimated cadmium requirements for 1945, used principally for plating, are up about five per cent over the 1944 needs. This takes on special importance when it is recognized that the over-all cadmium stocks have dropped about 25 per cent from the inventories on hand at the start of 1944. Because of this condition there will be less cadmium available for civilian uses in 1945 than in 1944. Army and Navy officials present at the meeting stated that the armed services needed more cadmium for the plating of aircraft and some tank parts. These armed service representatives stated that they had conserved the use of 1,500,000 pounds of cadmium annually by switching from that metal to zinc on alternate plated finishes.

Carbon Tetrachloride Now Under Order M-300 When Order M-363 was revoked on December 22, 1944, the control of carbon tetrachloride was transferred to Schedule 78 of Order M-300. Under the new schedule "the small order exemption without use certificate per person per month is any less-drum quantity totaling less than 700 pounds."

Permission Granted to Use Polished Chromium Name Plates The War Production Board revealed on December 30, 1944, that the American Stove Co. of St. Louis was granted permission to use from inventory 25,000 zinc die cast polished chromium name plates for use on domestic gas ranges.

Copper Base Alloy for Plating Has Been Banned The War Production Board announced on January 17, 1945, that the issuance of allotments of copper base alloy for use in the production of common and safety pins, church goods, and "blanks" for silverplated table flatware will be discontinued April 1, 1945. No allotments of copper base alloy for the manufacture of badges for firemen, policemen and plant protective personnel, or for etched metal plates for non-military identification purposes, will be issued during the first quarter of 1945. Manufacturers of these articles must now use substitutes for copper base alloy.

Corrective Spectacles' Regulation Amended Schedule 2 to General Limitation Order L-214 was amended on December 26, 1944. This order which governs corrective spectacles amended Section B; 3 (iv) so that this restriction now reads: "Pure nickel or any nickel bearing alloy may be used in making alloy gold (14 carat or less) and making silver brazing alloy, but the total nickel content shall not exceed 6 per cent."

Costume Jewelry With Tin Content Banned The WPB amended Order M-43 on December 30, 1944, in an effort to smash the black market use of tin in the manufacture of costume jewelry, souvenirs, trophies, advertising specialties, and art specialties. To obtain a more effective control over tin, Order M-21-e was revoked, and the control of tin used in tin and terneplate was transferred from the WPB's Steel Division to the WPB's Lead, Tin and Zinc Division. Amended Order M-43 now states that the use of tin in the articles enumerated in List A, which includes costume jewelry and novelties, can no longer be received from manufacturers. And retailers are restrained from selling such articles after March 1, 1945, unless the retailer files with the WPB an inventory of all articles covered under List A. Special authorization must be obtained to dispose of these articles after March 1, 1945.

Enameled Ware Shipments Increase The total value of enameled ware shipments during the third quarter of 1944, according to the Census Bureau, amounted to $6,738,000. This compares with $5,210,000 during the second quarter of 1944, and with $5,164,000 during the first quarter of 1944. The value of the shipments in the first nine months of 1944 was 17 per cent greater than in the same period in 1943.

Galvanized Can Shipments Increased in 1944 The shipments of galvanized cans, according to the Bureau of Census, during the third quarter of 1944 amounted to 94,746 dozen units as compared with 102,758 dozen units during the second quarter of 1944 and with 99,915 dozen units during the first quarter of 1944. During the first nine months of 1944, shipments of galvanized cans were 79 per cent greater than during the same period in 1943.

NWLB Amends Its Rules of Procedure The National War Labor Board issued three amendments to its Rules of Organization and Procedure on January 7, 1945. The amended procedure provides that the appropriate disputes division shall select an arbitrator from the list provided by the Board or its agents. The amended rules also stipulate that in reviewing an arbitrator's award on a wage or salary issue the Board or Industry Commission is not to accept additional evidence, comments, briefs or oral arguments unless such additional information is specifically requested. And in processing petitions for review, the procedure provides that when the appeals committee considers the merits of any issue it must limit the considerations to the file of the agent of the Board and the petition and answer for review and not consider subsequent documents reviewed by the Committee.

Causes for Manpower Shortages as Seen by Labor In the January number of LABOR'S MONTHLY SURVEY, published by the A. F. of L., this official labor organ states that manpower shortages are caused by inadequate housing, inadequate transportation, the impossibility of getting adequate meals, and home duties which requires housewives to leave their work. It states that "most of the manpower shortages are in plants where labor conditions are substandard. Low wages are the chief problem. In many of the plants converted from civilian work, wages were low before the war, and the plants, caught in the War Labor Board wage freeze, have not been permitted to raise their wages to adequate levels. Situations of this kind can be corrected if the War Production Board certifies to the War Labor Board that low wages are interfering with war production."

Lead Chemical Under Allocation of New Order Lead chemicals were placed under allocation of Conservation Order M-384, which was issued on January 15, 1945, because of the shortage in the supply of lead chemicals for private account and for export, and for national defense purposes. The new order covers metallic lead, lead acetate, lead antimonate, lead arsenate, lead arsenite, lead oxide, lead chloride, lead nitrate, lead silicate (mono), lead silicate (di), litharge, red lead, white lead, basic carbonate of white lead, basic sulphate of white lead, lead chrome pigments, chrome yellow, chrome orange, chrome green, and molybdate chrome orange. The order also placed a restriction on the use of leaded zinc oxide.

Lead Order Amended General Preference Order M-38, as amended January 15, 1945, provides that "in computing the amount of lead permitted to be used for articles and uses shown in List C for the first quarter of 1945, each person shall include the amount of lead in any end products not fully fabricated on the first day of January, 1945. Lead in any end products fully fabricated on the first day of January, 1945, shall not be included." List B which covers unrestricted articles and uses of lead has some changes. For example, one now reads: "*plating* where lead is used in place of either cadmium or tin plating, or where the use of lead is for chemical resistance other than atmospheric corrosion." Other restricted uses of lead now read: "*plating* anodes where lead is used in place of tin or cadmium or for chemical resistance other than atmospheric corrosion." The amended order has also placed on unrestricted List B the use of lead for "*coating* of copper wire."

How to Get Lead From the Metals Reserve Company The War Production Board issued Direction 1 to Order M-38, on January 10, 1945. This direction provides that "pursuant to paragraph (c), any person unable to obtain lead from the regular sources of supply and wishing to procure lead from the Metals Reserve Company, shall: (b) For lead to be delivered during the month of February, 1945, make application in writing to the War Production Board on Form WPB-4037; and (c) for lead to be delivered after February 28, 1945, make application on Form WPB-95, as provided in paragraph (d) of Order M-38."

Luggage Permitted to Have Nonferrous Metal Parts General Limitation Order L-284 was amended on January 8, 1945, to bring the order in conformity with Priorities Regulation No. 25 and to permit the free use of aluminum, to permit the use of copper and copper base alloys when authorized by Order M-9-c and to allow use of zinc and zinc alloys when permitted under Order M-11-b in the production of luggage.

MRO Regulations Amended Preference Rating Order P-89 was amended on January 3, 1945, for the purpose of establishing maintenance, repair and operating supplies quotas for 1945 on a basis similar to those granted in 1944. Paragraph (8) was amended to read: "In addition, there may be included as maintenance, repair and operating supplies minor capital additions, the costs of which do not exceed $500 each, excluding the P-89 producer's cost of labor and excluding cost of installation (installation material is covered by paragraph (a) (9)). No complete minor capital addition shall be subdivided for the purpose of coming within this definition."

OPA Regional Offices Now Pass on Service Charge Regulations The Office of Price Administration, on December 27, 1944, authorized its regional offices to act on applications from sellers of services who request simplification of the methods of determining their ceiling prices.

Peroxygen Chemical Small Order Exemption Reduced The monthly small order exemption of peroxygen chemicals was reduced from five carboys (600 pounds) to one carboy (120 pounds) by amending Schedule 5 of Order M-300 on January 12, 1945.

Potassium Carbonate Under Order M-300 On January 10, 1945, the control of potassium carbonate was placed under control of Schedule 85 of Order M-300. The Schedule provides that consumers must file Form WPB-2945 by the 15th of the month preceding the month in which the delivery is to be made.

Priorities Regulation No. 3 Was Amended Priorities Regulation No. 3 was amended on January 9, 1945, to provide that such items as hard rubber drums need no longer be acquired with the assistance of blanket maintenance, repair and operating supplies rating.

Sodium Phosphate Restrictions Eased In revoking Order M-334 the control of sodium phosphates were transfered to Schedule 82 of Order M-300 on January 2, 1945. Schedule 82 provides that customers may obtain a maximum of 80,000 pounds of trisodium phosphate bi-monthly by submitting an end use certification. In making this transfer allocation control was lifted from anhydrous trisodium phosphate, crystal disodium phosphate, sodium tripolyphosphate, crystal tetrasodium pyrophosphate, sodium hexa meta phosphate, and sodium tetra phosphate.

Special War Census of Manufactures to Be Made During 1945 the Census Bureau will compile a 1944 Special War Census of Manufactures. This census will cover plant investment, value of work done and products produced during 1944, the cost of materials, the cost of fuel and power, the number and kinds of employees, the number of man-hours worked according to months, and other information. Questionnaires will be mailed to about 300,000 different firms. It is estimated that 225,000 firms will fill out the forms. Firms reporting their production as being less than $5,000 will be eliminated from the tabulations.

Steel Drum Order Amended Steel shipping drum Limitation Order L-197 was amended on January 18, 1945, for the purpose of providing that allotments will be made on the basis of 95% of the tonnage of new drums used by a person during a corresponding quarter in 1943, or on the basis of 23¾% of the tonnage of new drums used by him during the year 1943.

Better Vision Increases Production A manual has been prepared by the WPB for the purpose of conserving and utilizing the eyesight of workers in war plants. The authors of this manual are of the opinion that only one pair of glasses out of 20 which workers wear are suited to their jobs, for it is their contention that reading distance is not working distance. In their survey they find that defective vision and bad lighting are well recognized reasons for spoilage. Copies of the manual and appraisal form may be obtained free of charge by officials in charge of production by writing to Dr. Donald B. Keyes, Director, Office of Production Research and Development, War Production Board, Washington 25, D. C.

Patents

Alkaline Detergent

U. S. Pat. 2,359,587. C. Schwartz, Oct. 3, 1944. An alkaline detergent for cleaning tin, comprising by weight about 30 to 90% alkali-metal metasilicate, about 5 to 55% alkali-metal hydroxide, about 3 to 20% alkali-metal perborate, about 1 to 10% of a water-soluble zinc salt and about 1 to 10% of a water-soluble calcium salt.

Example:

Sodium metasilicate	53%
Sodium hydroxide	33%
Sodium perborate	10%
Zinc sulfate	2%
Calcium chloride	2%

Corrosion Prevention of Metals

U. S. Pat. 2,359,799. R. W. Shoemaker, assignor to Agnes J. Reeves Greer, Oct. 10, 1944. The method of treating metal to prevent corrosion which consists in cleaning the surfaces of the metal, then coating the clean surfaces of the metal with a film of a solution consisting of ordinary soap, a precipitating agent consisting of a mixture of sulphate of aluminum, sodium carbonate and sodium bicarbonate and a wetting agent taken from a group consisting of sodium metaphosphate, sodium hexametaphosphate and sodium salt of sulphated alcohol obtained from coconut oil, and then removing the metal from the solution and drying it to form a protective film upon the surfaces of the metal.

Copper Refining Solution

U. S. Pat. 2,361,013. S. A. Corran, assignor to Nassau Smelting & Refining Co., Inc., Oct. 24, 1944. The process of refining lead-containing materials consisting principally of copper, which comprises electrolyzing anodes of such a material in an electrolytic cell comprising an aqueous copper sulphate electrolyte containing at least 100 but not substantially more than 200 grams per litre of free sulphuric acid and also containing sufficient material from the class consisting of aromatic sulphonic acids to materially inhibit polarization of the anodes.

Example:

Copper (as sulfate)	30 g./L.
Free sulfuric acid	150 "
Benzene disulfonate	60 "
Glue	as required

50°C. 0.24 v. 15 amp./sq. ft.

Bright Nickel Bath

U. S. Pat. 2,361,720. W. P. terHorst, assignor to United States Rubber Co., Oct. 31, 1944. A nickel electrodeposition bath comprising an aqueous acid solution of a nickel salt selected from the group consisting of nickel chloride, and nickel sulphate, and also containing as a nickel brightening agent a pyrimidine compound selected from the class consisting of the sulphuric acid conversion products of alkyl-substituted 2-mercapto dihydropyrimidines, and their salts, said conversion products resulting from reacting alkyl-substituted 2-mercapto dihydropyrimidines with concentrated sulfuric acid, the reaction being characterized by evolution of sulfur dioxide, and heating the reaction mixture until the evolution of sulfur dioxide has substantially ceased.

Example:

Nickel sulfate	37 oz./gal.
Nickel chloride	8 "
Boric acid	5 "
Brightener	0.5–2.0 g./L.

110-130°F. pH = 3-5 75 amp./sq.ft.

Metal Cleaner

U. S. Pat. 2,362,284. L. McDonald, Nov. 7, 1944. A metal cleaning composition for the removal of metallic oxide, tarnish, or scale, comprising by weight:

Bentonite	10 to 30 parts
Glucono delta-lactone	10 to 20 "
Wetting agent	about 2 "

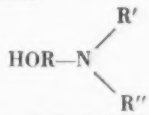
admixed with tripoli and infusorial earth, each of the latter in substantial proportions to make up a total of 100 parts.

Example:

Tripoli	20 parts by wt.
Infusorial earth	20 " "
Bentonite	20 " "
50% Gluconic acid sol'n	30 " "
Sodium lauryl sulfonate	2 " "

Corrosion Prevention of Metals

U. S. Pat. 2,362,332. J. C. Zimmer & E. W. Carlson, assignors to Standard Oil Devel. Co., Nov. 7, 1944. A corrosion preventive composition for metals comprising a petroleum fraction, a saponaceous material and 0.1–5% of an organic amine having a boiling point above approximately 250°F. and having a structural formula



wherein R is an aliphatic hydrocarbon group, R′ is a group of the class consisting of hydrogen, aliphatic, and aromatic hydrocarbon radicals and R″ is a group of the class consisting of aliphatic and aromatic hydrocarbon radicals.

Example:

Petroleum distillate	83%
Mahogany soap and degras in ratio of 1:15 to 15:1	15%
Diethylaminoethanol	2%

Coloring Aluminum

U. S. Pat. 2,363,339. G. Kraft & N. L. Solomon, Nov. 21, 1944. The herein described electro chemical process which comprises subjecting a body of cleaned aluminum as an anode to a solution consisting essentially of water and substantially 5–40% by volume of hydrofluosilicic acid only and under electrical pressure of about 6 to 40 volts for a time sufficient to provide a surface finish on said body emanating iridescent colors.

Example:

Fluosilicic acid	20%
Temp. = 65°F.	
Voltage = 15.	
C.D. = 10 amp./sq. ft.	

Surface Finish Comparator

U. S. Pat. 2,364,609. E. J. Elmquist, Dec. 12, 1944. An article of manufacture, a surface finish comparator comprising a plurality of cylinders having different physical surface finishes and mounted on a spindle, at least one of which cylinders has a flat portion agreeing in finish with the finish of the rest of the cylinder, for comparison with the surface finish of flat articles.

Cleaning Apparatus

U. S. Pat. 2,364,704. E. E. Franz, assignor to Western Electric Co., Inc., Dec. 12, 1944. A cleaning apparatus comprising a cleaning unit including a cup-shaped element, with apertures disposed in a circular arrangement in the bottom portion thereof, and opposing brushes with their free ends substantially meeting adjacent the apertures, a shaft, having longitudinally extending grooves therein communicating with the apertures, supporting the unit, means to support the shaft for movement about its axis, a reservoir for a supply of cleaning fluid, a feeding passageway leading from the reservoir to the grooves in the shaft, operable fluid circulating means disposed in the feeding passageway to force fluid from the supply through the passageway, the grooves, the apertures and through the brushes to overflow the open end of the element, a return passageway to receive the fluid overflowing from the element and return it to the reservoir, power means to operate the circulating means, and means to operatively connect the shaft to the power means to cause oscillation of the shaft and unit to cause the brushes, aided by the fluid travelling therethrough, to remove foreign particles from an article disposed between the brushes.

Detergent Composition

U. S. Pat. 2,364,767. P. T. Zizinia & T. L. McKenna, assignors to Allied Chem. & Dye Corp., Dec. 12, 1944. A detergent composition consisting essentially of a neutral water-soluble salt of an alkyl aryl sulfonic acid and from about 40% to about 65% by weight of a water-soluble sulfate selected from the group consisting of alkali metal and alkaline earth metal sulfates, in which alkyl aryl sulfonic acid salt the aryl group is mononuclear and the alkyl group contains, on the average, from about 12 to 23 carbon atoms, the product being in the form of a mass of separate approximately globular hollow particles, at least about 85% of the mass consisting of particles of such size that they pass through a 20 mesh screen but are retained on a 60 mesh screen, the product in mass having a bulk density in the range of about .07 to .15.

Plating Rack

U. S. Pat. 2,364,822. M. S. Schneider, Dec. 12, 1944. A knockdown plating rack comprising at least two rod-like sections arranged substantially end to end, a tension element extending between and connecting said sections and having a screw-threaded engagement with at least one of said sections, the adjacent ends of said sections having clamping shoulders adjacent said tension element, and a work supporting element extending laterally from said sections and having an opening through which said tension element passes, a portion of said work supporting element adjacent said tension ele-

ment being clamped between said shoulders, and said work supporting element being angularly adjustable about the axis of said tension element.

Tinning Strip

U. S. Pat. 2,364,904. J. D. Keller, assignor to The Wean Engineering Co., Inc., Dec. 12, 1944. In a method of tinning metal strip, the steps including bringing the strip into contact with molten tin, and inducing a flow of an oily liquid along and in contact with the strip in a direction opposite to the direction of strip motion and at a velocity much greater than the velocity of the strip, thereby removing excess tin therefrom, and cooling the liquid to increase its viscosity and thereby enhance the wiping action thereof.

Anodizing Aluminum

U. S. Pat. 2,364,964. J. Frasch, vested in the Alien Property Custodian, Dec. 12, 1944. A process for protecting an aluminum or an aluminum alloy article against corrosion comprising immersing the article to be protected in a bath consisting of approximately 30 grams of sodium aluminate, 10 grams of sodium silicate and 8 grams of caustic soda per liter of solution having a pH between 8.5 and 12 and then passing between said article serving as an electrode in said bath and another electrode therein an electric current having an initial potential greater than 30 volts.

Degreasing Apparatus

U. S. Pat. 2,364,976. M. Heller, Dec. 12, 1944. In a degreasing apparatus of the kind in which articles to be degreased are subjected to the vapours of a grease-solvent, the combination of an elongated degreasing tank to be permeated by the said vapours, an elongated perforated container for the articles in the degreasing tank, and an elongated condenser disposed in the tank above the container with its axis substantially horizontal and parallel with their long axes, said condenser having means automatically affording without further orientation of the condenser a constantly aligned row of drip points for solvent vapour condensed on its surface.

Abrasive Blasting

U. S. Pat. 2,365,250. T. C. Crowley, assignor to Turco Products, Inc., Dec. 19, 1944. Cleaning apparatus, comprising, in combination, a hopper adapted to contain a pulverulent abrasive, a line for supplying steam under pressure, a nozzle having concentric substantially coplanar discharge orifices, a fluid line capable of delivering fluid under pressure and having its outlet communicating with the innermost of the discharge orifices, and a passageway leading from the hopper to the fluid line whereby abrasive is received from the hopper by gravity flow and deposited in the fluid line, a check valve in said passageway seating towards the hopper, said line for supplying steam under pressure having its outlet end communicating with the outermost of the discharge orifices.

Hot Dipping

U. S. Pat. 2,365,336. M. L. Dorfan, assignor, by mesne assignments, to Koppers Co., Inc., Dec. 19, 1944. An apparatus for heating coating material, comprising an open top casing having a bottom and side walls formed of refractory material, a coating tank within and spaced from the bottom and side walls of the casing, I-beams between the casing and tank forming lateral supports for the side walls of the tank and dividing the space between the adjacent vertical walls of the casing and tank into a plurality of vertical passages, I-beams between the bottom of the tank and the bottom of the casing supporting the tank and dividing the space between said bottoms into horizontal passages communicating with said vertical passages, gas supply and delivery conduits at the top of said casing communicating one with the upper ends of a portion of said vertical passages and the other with the upper ends of the remainder thereof, and means for supplying said supply conduit with heated gases, and for removing them through said delivery conduit, said gases flowing through said passages from said supply conduit to said delivery conduit.

Sheet Polishing Machine

U. S. Pat. 2,365,480. D. A. McArthur, assignor to The Wean Engineering Co., Inc., Dec. 19, 1944. In an apparatus for polishing coated sheets, a plurality of pairs of rolls between which the sheets pass, said rolls being composed of a mandrel or shaft and fabric discs packed thereon against an abutment fixed to the mandrel adjacent one end, one roll of each of certain of said pairs having its discs packed from one side of the apparatus and one roll of each of the remaining pairs having its discs packed from the other side of the apparatus.

Electrolytic Etching

U. S. Pat. 2,365,539. L. C. Flowers, assignor to Westinghouse Elec. & Mfg. Co., Dec. 19, 1944. In the method of etching polished surfaces of stainless steel and stainless iron by the application of a relatively noncorrosive flux to avoid etching and blemishing of the polished surfaces except at predetermined areas, the steps of applying to the metal an electrically conducting aqueous solution of a flux substantially noncorrosive to the stainless steel and stainless iron, the flux selected from the class consisting of zinc chloride, ammonium chloride and aniline phosphate, disposing a movable electrode closely adjacent to the metal and in contact with the aqueous solution, passing an electrical current from the electrode to the metal through the aqueous solution, with the metal being the anode, and moving the electrode over the predetermined areas to be etched while the current is flowing, the passage of the electrical current rendering the flux solution between the electrode and metal temporarily corrosive to the metal to effect etching, the flux solution after electrical current ceases to flow therethrough becoming relatively noncorrosive to the metal.

Electroforming

U. S. Pat. 2,365,670. E. H. Wallace, assignor to United States Rubber Co., Dec. 26, 1944. The method of making a heat exchange tube which consists in providing a core of predetermined shape, placing around the core in enclosing relation therewith a flexible sheet having numerous metal projections extending therethrough into contacting relation with said core, electrically connecting said projections at the outer surface of said sheet, electrolytically depositing a tube about said sheet to form a heat exchange tube integral with said projections, and removing the core and sheet from the interior of said tube.

Abrasive Blasting

U. S. Pat. 2,365,948. C. M. Gossard, assignor to Pangborn Corp., Dec. 26, 1944. abrasive blasting apparatus, a bin for storing abrasive particles, abrasive projecting apparatus, means providing a circuit for passing abrasive particles from said bin to the abrasive projecting apparatus and returning the projected particles into said bin, means for feeding abrasive particles from an auxiliary source into said circuit, means interrupting the movement of abrasive particles from the auxiliary source into said circuit, and means operable upon the presence of a predetermined quantity of abrasive in said bin for rendering said interrupting means operative.

Iron Recovery from Pickles

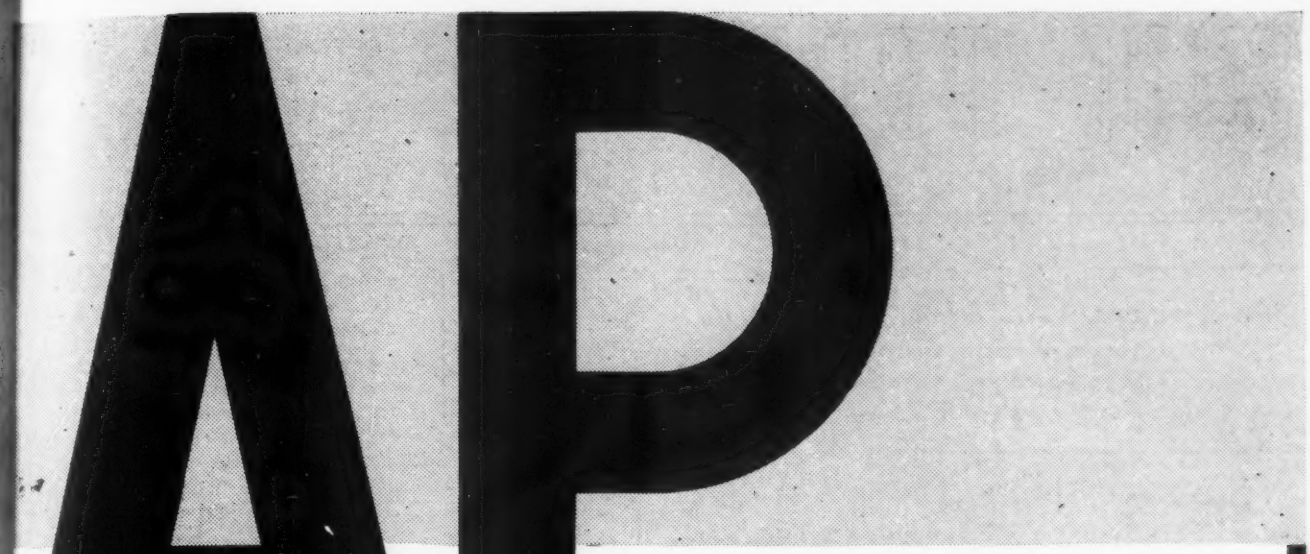
U. S. Pat. 2,366,298. S. F. Urban, Jan. 1945. The method of recovering iron from spent pickling solutions containing iron sulphate and sulphuric acid, which comprises placing the solution in an electrolytic tank providing a mercury cathode and an insoluble anode in the said solution, adding from about 3 to about 12½ per cent of ammonium sulphate to the said solution to increase the rate of absorption of iron to the mercury cathode upon electrolysis, and electrolyzing the solution to deposit iron in the mercury cathode and regenerate acid in the solution.

Glass Electrode

U. S. Pat. 2,366,489. H. H. Cary & T. Baxter, assignors to National Technical Lab. Jan. 2, 1945. A glass electrode providing an inner reference surface and an outer test surface and having substantially zero asymmetry potential, which glass electrode includes a glass membrane chemically-etched on both said reference and test surfaces to a sufficient degree to reduce the asymmetry potential substantially to zero.

Low Reflection Finish

U. S. Pat. 2,366,516. W. Geffcken & E. Berger (Germany), vested in the Alien Property Custodian, Jan. 2, 1945. The method of producing on an object a thin hardened layer of material capable of reducing surface reflection and strongly resistant to chemical and mechanical attacks, comprising applying to the object an aqueous dispersion of a gel-like low hydrated silicon dioxide, drying the dispersion to form a gel-like layer on the object and thereafter heating to a temperature of only 250°C. to convert the gel-like layer into a hardened reflection reducing surface consisting of a low-hydrated oxide of silicon.



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SHOP PROBLEMS

PLATING AND FINISHI
POLISHING — BUFFI
CLEANING — PICKLI
HOT DIP FINISHI

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Buffing and Polishing

Question: We have quite a lot of old brass lamps and other old antiques parts to be buffed and polished, and we would like to have any information that you have available on this subject.

O. F. A. Co.

Answer: The same procedure is used as when polishing new brass, namely cutting down with tripoli composition followed by coloring with a brass coloring composition.

The lacquer should be removed from these articles before polishing and a cyanide dip is also advisable if it is desired to remove the tarnish from the recesses.

Rainbow Plating

Question: We are interested in the process called "*Rainbow Plating*", which we understand is a novel electroplate effect, which was described by Mr. O. P. Watts to a recent Meeting of the United States Electrochemical Society in New York.

Perhaps you could be kind enough to bring us in touch with Mr. Watts, as we should like to hear from him whether this process is patented and to have fullest possible particulars as to its effect and application.

N. M. & C., Ltd.

Answer: We would suggest that you get copies of Dr. Watts' papers from The Electrochemical Society, Columbia University, New York City. Ask for preprints 84-9 and 85-13 @ 50c each.

You may communicate with Dr. Watts at the following address:

Dr. Oliver P. Watts,
114 North Spooner Street,
Madison, Wisconsin.

Plant Diagrams

Question: I am desirous of constructing an acid copper plating plant for experimental purposes in my home.

Where would I be able to procure diagrams or a list of specifications for such a plant?

My home is supplied with the standard 110v A. C. current.

N. T. J.

Answer: We would suggest that you examine a copy of Electrodeposition of Metals by Langbein and Brannt, and the 1944 edition of the *Plating and Finishing Guidebook* for details.

Plating on Die Cast Zinc

Question: We are attempting to determine the practicability of plating chromium direct on die cast zinc.

Any information which you may offer as to types of solutions, plating methods and references would be deeply appreciated.

U. B. & M. M. Co., Inc.

Answer: The chromium deposit from the usual sulfate bath is dull, and tends to crack because of the soft base. A patent was issued to Murray (U. S. Pat. No. 2,234,189, Mar. 11, 1941) covering a solution containing the following:

Chromic acid	2½ lb./gal.
Glycerine	8 oz./gal.
Phenol	2 "
Ammonium persulfate	3 "

Temperature 140°F.

Cadmium on Brass

Question: Will you kindly forward to me any information you might have about plating cadmium directly on brass?

It has been stated by a few in the trade that there is some kind of a galvanic action between the brass and cadmium that eventually dissolves the cadmium to powder and then leaves the brass exposed. I have seen cadmium do this on brass but would like to know if it is true or if it was caused from moisture.

L. J. C.

Answer: Cadmium can be plated on brass without any trouble, and moisture may be causing the powdering.

Galvanic action between brass and cadmium would not be unusual since the protective value of cadmium deposits is based on their sacrifice action, so it would be expected that the cadmium would eventually dissolve.

Another angle to be investigated is the physical condition of the cadmium deposit itself.

Critical Materials

Question: Our problem is to endeavor to plate a zinc die cast safety razor with a nickel or chrome-like finish and yet not use critical materials for same. The writer has definite knowledge of the existence of such a process and seeks your assistance in locating the source employing this method.

We are not particular what kind of material or process is used, just so it has a n finish and will hold its lustre for a period at least one year.

S. W. P. Co

Answer: We know of no metals which produce a nickel or chromium-like finish, are not on the critical list, except preci metals such as indium or palladium.

Addition Agents

Question: Please send complete inform tion and sources of materials of addit agents for accelerating pickling action reducing the attack on the base steel.

G. R. & D. C

Answer: A list of suppliers of such ma rials will be found on page 111 of the 19 edition of our Buyers' Directory, tear sh of which is enclosed.

Blistering of Deposits

Question: We occasionally get parts for finishing and electroplating that are ma out of some sort of Pot metal. We are unab to find the exact alloy it is made out Could you advise the best method to repl it? At the present time we encounter di culty with peeling and blistering, sometim it comes out of the silver solution lookin good, then after a day or so it will sho blisters. We have tried plating this met with cadmium, copper, lead and nick and have had trouble with all of them. would be appreciated if some informati could be furnished us.

R. A. P

Answer: "Pot" metal is a highly variab metal, and may contain any or all of t metals, tin, zinc, copper, aluminum, le and antimony.

Blistering of deposits on such metals often due to overcleaning. We would sug gest that you remove polishing compound with a solvent, after which the articles shou be given a mild alkaline cleaning and rinse They should next be immersed in a solutio containing one part of hydrochloric acid an four parts of water, rinsed and cyanid copper flashed.

Non-Priority Plating

Question: Would you kindly advise me it is permissable for a job-plating shop the present time to do plating in nickel-chrome—cadmium and tin on non-priority work such as boat work and other non-essen tial work as is brought in by civilians.

H. L. S.

Answer: It is not permissable to pla nickel, cadmium or tin on non-priority work

There are no restrictions on chromium tha we are aware of, but we would suggest that you communicate with the local branch of the War Production Board for confirmation

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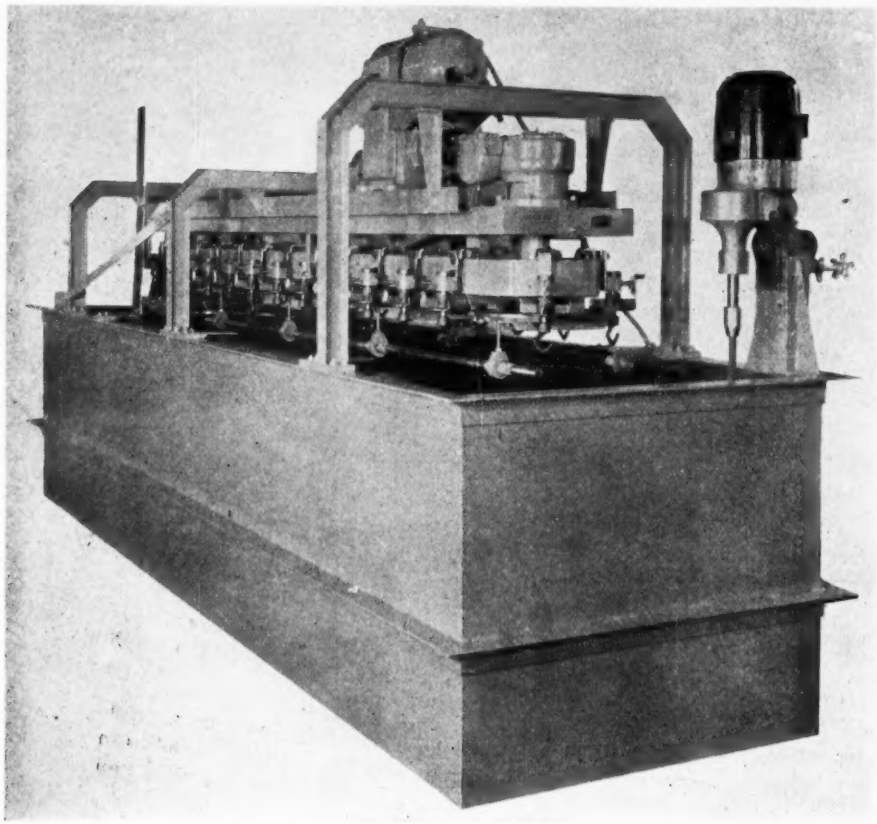

New High-Speed Plater

A new reciprocating type semi-automatic high-speed plating machine with rotating cathode has just been developed by Lasalco, Inc., Dept. MF, St. Louis. Put in service within the past few weeks with a leading aircraft plant, this new machine utilizes man-hours more efficiently, and promises notable cost reductions because of its ability to maintain the even quality of solution at the cathode, its construction to prevent the corrosion of operating parts, and its adaptability for plating inside surfaces of bearings and other similar parts, large and small.

A single drive maintains both reciproc ing action and chain travel, with the cha and mechanism submerged in oil to preve corrosion. This latter mechanism is alm entirely enclosed. Plating tank can be pr vided with agitator boot for either a sing type of solution agitation, or a combinati of several motions.

The machine can be furnished in any si to suit specific requirements or condition

For complete description, illustration, an information regarding special applicatio write Lasalco, Inc., Dept. MF, 2118 LaSal St., St. Louis 10, Mo.

Duracite

Duracite, a new acid-and-alkali-proo cement for bonding brick or tile in aci proof masonry construction has been an nounced by U. S. Stoneware Company, Dep MF, Akron, Ohio. It is a resinous cemen based on U. S. Stoneware's Duralon seri of furane resins. Duracite comes in the for of a Liquid and Powder and is mixed on th job at the time of use. It is of the quic setting type, taking an initial set in less tha thirty minutes.

Duracite shows virtually zero absorptio characteristics, and excellent resistance t most inorganic acids, organic acids, all alk lies, oil and solvents, at temperatures up t as high as 370° F. It has practically n definite shelf life, showing no deteriorati in storage.

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DIVERSEY D-MAN

New IONIC cleaner develops LIMITED FOAM BLANKET . . minimizes spark hazard!

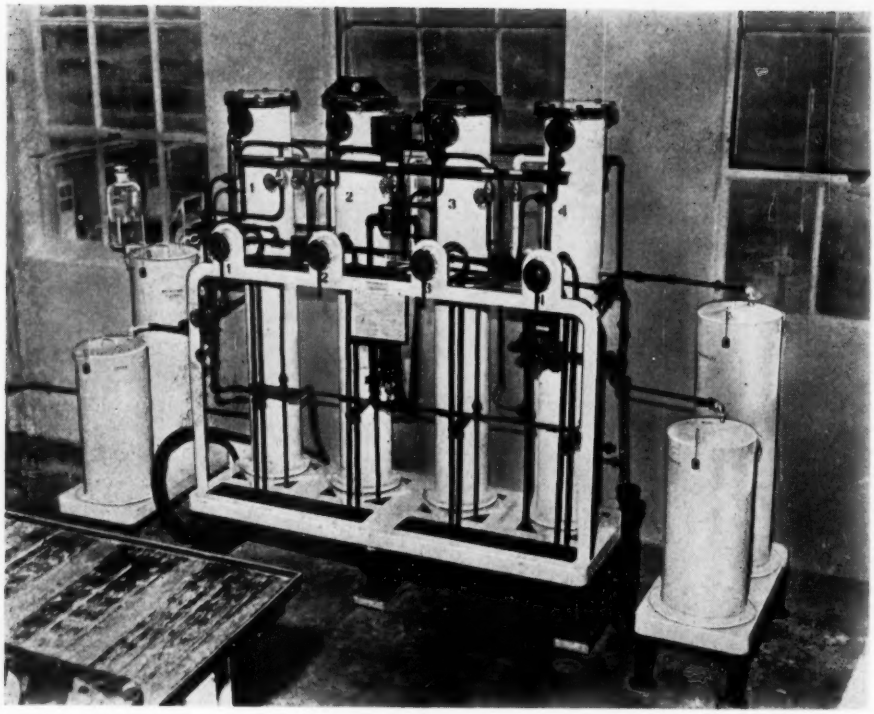
No need to worry about costly, nerve-shattering explosions when you use D-C No. 12 in your electro cleaning bath. Because of the presence of special detergents and wetting agents, this DIVERSEY cleaner develops a *limited* foam blanket that stays far below the bus bar . . . away from dangerous sparks that flash when work is moved.

Ordinary cleaners build up foam blankets *close* to bus bars, making hydrogen ignition easy. When this occurs, alkaline solution is sprayed far and wide and often contaminates nearby pickling or plating baths . . . which must then be filtered or discarded. D-C No. 12 helps avoid this trouble and expense.

And here's another DIVERSEY *extra*. Unique ionic characteristics make D-C No. 12 an unusually efficient conductor . . . for enhanced cleaning action with low current consumption. Oil, smut and dirt are easily removed from brass, bronze and copper without danger of attacking surfaces. Direct or reverse current may be used.

DIVERSEY D-C No. 12 has high emulsifying and wetting properties, is free-rinsing in cold water and is economical because of its longer solution life. Get acquainted with this safe, efficient, economical cleaner. For a liberal, experimental sample write Metal Industries Dept.

The DIVERSEY CORPORATION
53 West Jackson Boulevard, Chicago 4, Ill.



Filt-R-Stil

The chemical equivalent of distilled water becomes as readily available as tap water through the use of the Filt-R-Stil, equipment using a new process developed by American Cyanamid and Chemical Corporation, Dept. HF, 30 Rockefeller Plaza, New York, N. Y., for producing mineral-free water through the medium of melamine-derived, ion-exchange resins developed by the American Cyanamid Company. The large portable unit illustrated is of prefabricated type, with capacity of 2 to 3 gallons of mineral-free water per minute to accommodate the needs of such industries as manufacturers of pharmaceuticals, dyestuffs, textiles, leather, pa and electronic and electrical equipment, where a comparatively large volume demineralized water may be required. Filt-R-Stil is also produced in a laboratory size with a capacity of thirty gallons an and in a small portable unit with capa of eight to ten gallons per hour as w as in special, permanently installed sizes large industrial users.

Dry Tumbling Machine

A new machine for dry tumbling has b developed by Lewis Roe Mfg. Co., De MF, 1050 De Kalb Ave., Brooklyn 21, N.

The machine developed has an octago hard wood barrel, 14" in diameter and 2 long, with a partition in the center and mounted on an iron stand. It is equipp with a ¼ h.p. a.c. motor, 110 volts, with speed reducer to drive the machine at 40 r or any speed desired. The company clai that the electric current consumption approximately 1c per hour.

Further information may be obtained writing to the company at the above addre

Box-Type Oven

The Industrial Oven Engineering Co pany, Dept. MF, 11621 Detroit Aven Cleveland, has developed a standard box-ty oven for the high-speed evaporation a drying of highly volatile solvents. It is self-contained unit, with all heating equi ment and ductwork built into the oven she and is either shipped assembled ready t operate, or is shipped in prefabricated se

GREASELESS COMPOSITION

Used on Cotton Buffs, Tampico Wheels, Felt Bobs or Wheels on any metal parts doing away with costly set-up of polishing wheels—works fast, dries quickly, allowing operator to remove burrs or rough edges without damaging accurate parts—made up in various grain sizes—also used for producing satin or Butler finish on fixtures and interior decorative trim—leaves work clean and free from grease—put up in airtight containers.

Samples on request—Specify material on which it is to be used.

THE BUCKINGHAM PRODUCTS CO.

8900 HUBBELL AVENUE

DETROIT 27 MICHIGAN

PUT *Beckman* pH CONTROL TO WORK IN *YOUR* PLANT

1. INCREASING PLATING SPEEDS
2. REDUCING COSTLY "REJECTS"
3. PRODUCING SMOOTHER COATINGS
4. IMPROVING PLATING EFFICIENCIES

By Beckman-controlling the pH of your plating processes you can make FOUR important savings in your plant operations . . . *vital* savings that mean higher quality platings at substantially lower operating costs . . .

1. By closely controlling the pH of your plating baths you can generally operate at higher current densities without risk of faulty coatings. This means faster plating, reduced costs. *And remember—Beckman is the only pH equipment that will accurately control alkaline plating operations such as cadmium, zinc, brass, etc.!*

2. The controlled-coatings produced by Beckman-regulated plating baths minimize blistering, peeling and off-color deposits, thus greatly reducing "rejects" and costly waste of time and materials.

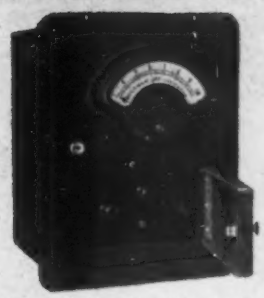
3. Not only are blistering and peeling practically eliminated, but Beckman-controlled coatings are far more uniform and smoother, insuring highest quality platings on run after run.

4. And because Beckman-controlled plating processes are simple to handle and uniformly effective at all times, even inexperienced plant workers can turn out consistently top-quality plating jobs with minimum loss. Over-all plant efficiencies are greatly increased!

LET US HELP YOU take full advantage of the multiple savings possible through Beckman pH Control. Our engineering staff will gladly make recommendations to fit your particular requirements.

NATIONAL TECHNICAL LABORATORIES
SOUTH PASADENA • CALIFORNIA

WORLD'S LARGEST MANUFACTURER OF GLASS ELECTRODE pH EQUIPMENT



The Beckman Automatic pH indicator is the most advanced pH instrument available today. Incorporates many unique features found in no other make or type of equipment. Operates standard control and recording equipment. Ask for Bulletin 16!

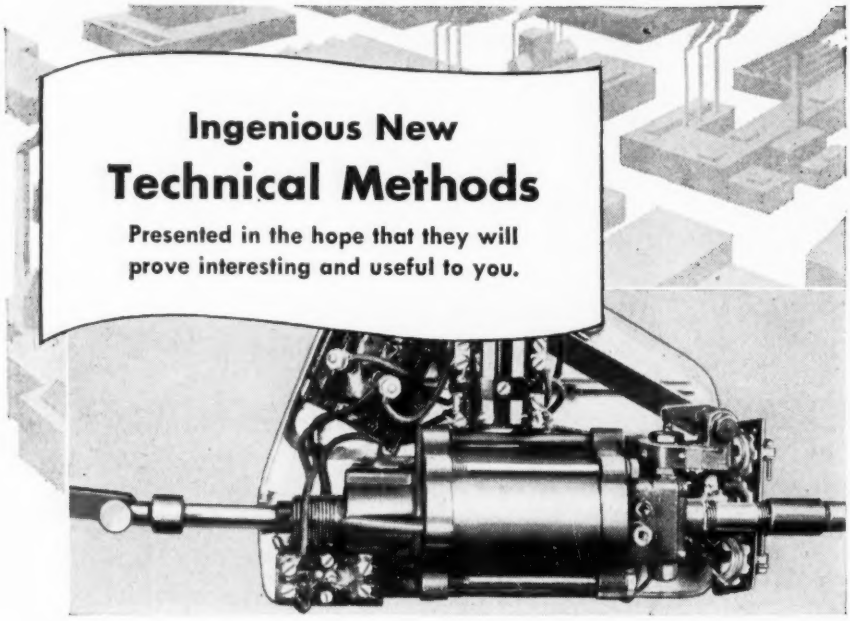
The Beckman Industrial pH Meter is ideal for portable plant and field use. Simple, quick, accurate. May be used with Beckman Flow Type and Immersion Type Electrode Assemblies for maintaining pH check on solutions in process. Ask for Bulletin 21!

SEND FOR YOUR COPY OF THESE HELPFUL BECKMAN BOOKLETS!

"What Every Executive Should Know About pH"—a simple, non-technical discussion of what pH is, how it's used, and its importance to modern industrial operations.

Bulletin 86—The most complete catalog available on modern pH equipment. Lists and describes over 60 different electrodes together with accessory equipment for all types of applications.

Beckman THE LEADING NAME IN pH



Ingenious New Technical Methods

Presented in the hope that they will prove interesting and useful to you.

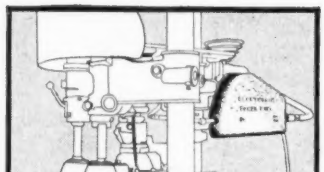
New Electroaire Power Unit Converts Standard Drill Press to Automatic

This exact control over feed and retraction speeds permits ready conversion of a standard drill press with tapping head into an automatic tapping machine, capable of producing Class III threads, even with comparatively unskilled operators. By adjusting speed to conform to the lead pitch of the threads being tapped, the tap will cut without forcing threads, and on the reverse the tap will actually "float" out of the part with no strain against the thread angle.

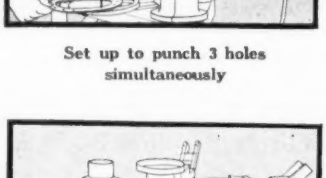
Air-powered jigs and fixtures can be opened, closed, and indexed by the Electroaire Power Feed. The unit can be set for a pre-determined number of cycles so that multiple holes can be drilled in the same piece without ejection, by means of an indexing fixture controlled and synchronized by the Electroaire Unit. One operator can run as many as two or three drill presses, turning out top-quality work with few rejects and with a minimum of tool breakage, thus effecting a great savings in time.

Present stockpiles of finest quality materials used in the manufacture of Wrigley's Spearmint chewing gum are now exhausted—necessitating discontinuance of production. When a supply of proven materials—known to be up to the finest standards of quality—is again available, Wrigley's will resume production—And Wrigley's Spearmint will be back to again help you on your job. In the meantime they are manufacturing a war brand. Wholesome but not excellent enough for the Wrigley brand name.

You can get complete information from Electrolin: Manufacturing Company, 1975 East 61st Street, Cleveland 3, Ohio

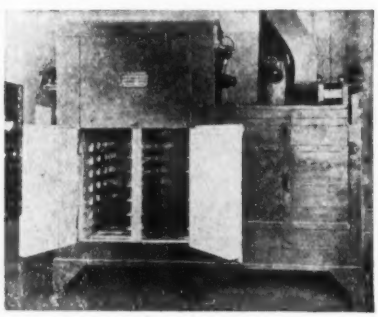


Set up to punch 3 holes simultaneously



Shows holes being drilled automatically

Z-55



tions for quick assembly at the point of operation.

Door sizes range from 3 feet wide by 3 feet high to 5 feet wide by 6 feet high, and working depth from 3 to 6 feet. The temperature range is from 150° to 900° F., with a tolerance of ±2°. Despite the fact that the oven is direct gas fired, a seeming hazard in the evaporation of large volumes of inflammable and explosive materials, it has been proved to be perfectly safe and has insurance company approval.

The oven illustrated is a standard size (4-foot by 5-foot door and 4-foot depth) with a preheating zone added, the latter heated by exhaust air from the oven proper. It is used to dry fabricated paper parts which have been dipped in a finishing solution consisting of approximately 50 percent alcohol and 50 percent solid matter. On this job it has reduced drying time from 25 minutes to 5 minutes.

METALLIZING NON-CONDUCTO

(*Continued from page 63*)

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A HIGH pH INDIUM CYANIDE BATH

(*Concluded from page 60*)

to decompose and precipitate in the following manner:

$$KIn(CN)_4 = KCN + In(CN)_3$$
$$KIn(OH)_4 = KOH + In(OH)_3$$

However, with the addition of caustic, the following equilibrium is favored:

$$KIn(CN)_4 + 4KOH = KIn(OH)_4 + 4KCN$$

Thus a mixture of cyanide and caustic tends to dissolve either type of precipitate, which is similar to that obtained in the cyanide zinc bath[8]. There was some evidence that this may account for the bath stability. When the baths contained little or no caustic, a red precipitate was formed which was similar to that reported by Dyer[6]. In the case of baths high in caustic and low in cyanide, a white gelatinous precipitate was formed. The precipitate obtained from the preparation of Bath No. 5 was boiled in a solution of caustic, cyanide and dextrose. The major portion of the precipitate dissolved and the indium was readily plated from the resulting bath.

Conclusions

The following composition is recommended for the high pH stabilized indium cyanide bath:

Indium	15– 30	grams per liter
Potassium Cyanide	140–160	" " "
Potassium Hydroxide	30– 40	" " "
Dextrose	20– 30	" " "
Current Density	15– 30	amp./sq. ft.
Temperature	Room	
Anodes	Steel	

This bath is easy to prepare and is considerably more stable than the cyanide bath. The plate possesses a white color from either a fresh or an old solution. The cathode efficiency decreases with increased current density.

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Answer Key

T, F, F, T, T, T, F, F, T, F

UNICHROME*

COATING 202

Gives Extra Protection in Strong Plating Baths

With Unichrome Coating 202 on your racks, even the toughest solution won't get to first base. Especially durable when force dried, it sticks to plating racks and fixtures *longer*—resisting even severe anodizing baths and strongly alkaline solutions. What's the reason? It's formulated of special resins that have shown maximum chemical resistance under actual shop conditions.

And although these resins are in great demand for other war uses today, there's been no change whatever in our formula. So start using this current-saving insulation now. Write for prices or a trial order.

* Reg. U. S. Pat. Off.

PROPERTIES

Chemical Resistance—Excellent for all plating cycles.

Toughness—Withstands repeated flexing and shop handling—cuts cleanly and easily at contacts.

Drying—Dipped at room temperature in container in which it is shipped—force dried at 200°F. for extra protection.

Adherence—Excellent for severe cycles. For moderate cycles "Air Dry" Coating is recommended.

UNITED CHROMIUM, INCORPORATED

51 East 42nd St., New York 17, N. Y. • 2751 E. Jefferson Ave., Detroit 7, Mich. • Waterbury 90, Conn.

TRY THESE OTHER UNICHROME MATERIALS

Unichrome "Air Dry" Rack Coating—a rack insulation that can be dipped and dried at room temperature, for use in all plating solutions

Unichrome Quick Dry Stop-Off 322—for cyanide copper and other plating work requiring an extremely adherent stop-off

Unichrome Quick Dry Stop-Off 323—for chromium and other plating work requiring a stop-off that can be peeled off after use.

Unichrome Resist—a solid insulating material for constructing composite racks, stop-off shields, insulating gaskets, etc.

Business Items

Bricker and Andes, 316 Atlantic Ave., Brooklyn, N. Y., and *Van Camp Products and Sales Co.*, 177 Parliament St., Toronto 2, Canada have been appointed sales agents and distributors of the inhibitors and metal working chemicals of the *American Chemical Paint Co.*, Ambler, Pa., U. S. A., and Walkerville, Ont., Canada, to expedite the service and supply of these materials to the metal working industries in their respective areas.

The territory covered by Bricker and Andes consists of the following counties in New York State: Manhattan, Kings, Queens, Richmond, Bronx, Nassau, Suffolk, Westchester and Rockland. In New Jersey—Hudson, Essex and Union.

The territory covered by Van Camp Products and Sales Co. is London east through Hamilton and the Niagara Peninsula, Toronto, Northern and Eastern Ontario and Montreal.

The experience of the technical staffs of these companies will supplement the cooperation of the American Chemical Paint Company's technical staff and laboratories in the solution of chemical metal working problems.

The engineering, metallurgical and consulting organization of *Sam Tour & Co., Inc.* of New York, announces the election of *Alexander Gobus* and *Charles Davidoff* as vice presidents.

Dr. E. I. Valyi, formerly vice president, and *Fred J. Tobias*, formerly production engineer,

A LESSON IN PLATING ARITHMETIC

720 Here's a new and better rack insulation for use in the strongly alkaline solutions used in plating ZINC, CADMIUM, NICKEL, TIN, HARD CHROME and duPont high speed COPPER. Excellent in acid solutions, too. Has greater resistance to hot cleaners and vastly superior adhesive qualities. Easily applied; quick air drying; permanently flexible; no carry-over; more economical because longer-lived and fewer coats required.

160 A dependable, easy-to-apply, long life Anodizing Rack insulation. Works equally well in either chromic or sulfuric process. No. 160 has long been successfully used by many platers for rack insulation in TIN, ZINC, COPPER, SILVER, NICKEL, CADMIUM and CHROME plating. Provides dependable, economical, long life, easy-to-apply insulation.

608 A STOP-OFF that withstands strong alkali and holds on a trimmed edge to prevent creep of the deposited metal. Gives outstanding results in alkaline COPPER, ZINC, TIN, CADMIUM, SILVER and HARD CHROME. Quick air drying; brushes easily and lays over irregular surfaces without bridging. Decidedly economical to use.

These three numbers add up to the correct answer to virtually every rack insulation problem. Samples and further information await your request.

NELSON J. QUINN COMPANY TOLEDO 7, OHIO

BUNATOL

John B. Kershaw

The *Hanson–Van Winkle–Munning Co.*, Matawan, N. J., manufacturers of electroplating equipment and supplies announces the assignment of *John D. Kershaw, Jr.*, as Field Engineer.

Mr. Kershaw attended the Crane Junior College of Chicago and subsequently received the degree of Bachelor of Science in Chemistry at Illinois Institute of Technology. Prior to the war he was head of the laboratory of the *P. E. Madden Co.* of Chicago, Ill., and later, was a field engineer located in Milwaukee for the same company. Since the war and until recently he was Supervisor of Plating in Aviation Div., Studebaker Corp., South Bend, Ind.

Mr. Kershaw will have his headquarters in the Detroit office of the H-VM-Co., at 2842 West Grand Blvd., and his services will be available to manufacturers in that district who are interested in electroplating.

Dr. R. C. Benner, Director of Research for the *Carborundum Company* for the past 18 years, has announced his retirement as of January 1, 1945.

Dr. Benner was graduated from the Uni-

Dr. R. C. Benner

are no longer associated with the company.

Met-Chem Processes, Inc., a Sam Tour & Co., Inc. affiliate is in process of dissolution.

Mr. Gobus, vice president and chief metallurgist, specializes in plant control of materials and processes, heat treating, metallography, radiography and related sciences. Mr. Davidoff, vice president and chemical engineer, specializes in precision casting, electrochemistry, metals finishing, corrosion problems and plastics.

Ethel Serfas Klingman has been appointed Assistant Manager of Advertising of the *Pennsylvania Salt Manufacturing Company*, chemical manufacturers, Philadelphia, Pa., effective January 1, 1945. She has been with the Company for the past seven years, and for the past two years has been Editor of *Contact*, one of the Company's house publications.

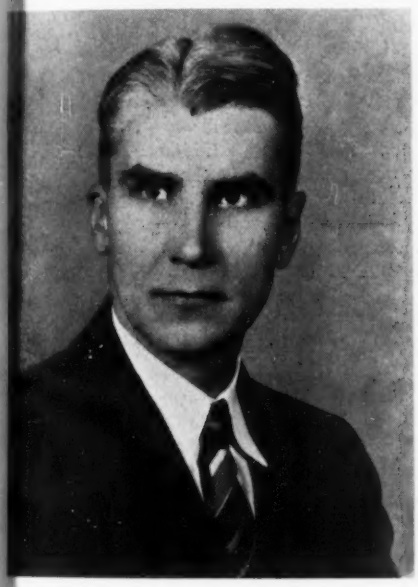
Dr. Bernard Agruss, research chemist, has joined the staff of *Battelle Institute*, Columbus, Ohio, where he will be engaged in electrochemical research.

A former associate of the American Smelting and Refining Company, Perth Amboy, New Jersey, Dr. Agruss holds Bachelor of Science and Master of Science degrees from Washington University and a Doctor of Philosophy degree from the University of Cincinnati. He is a member of the American Chemical Society, the Electrochemical Society, Tau Beta Pi, and Sigma Xi.

versity of Minnesota in Engineering in 1902, later taking his Ph.D. at the University of Wisconsin. During his business experience of 40 years, he has been a patent attorney, and a registered engineer, as well as a professional inventor, holding more than 250 patents covering not only the fields of abrasives, refractories and electric furnaces, but also dry cells, smoke screens and sulfur recovery.

Dr. Benner resides with his wife and one daughter at 460 College Avenue, Niagara Falls, N. Y., and has announced that after a brief rest, he intends to do consulting research work, undertaking only problems which interest him and for which his experience particularly fits him.

The *Optimus Detergents Company*, Matawan, N. J., manufacturers of metal cleaners and industrial cleaning materials for production and maintenance use, announce the appointment of *Joseph S. Brady* as Technical Supervisor, and *A. C. (Neil) Daly* as Technical Field Representative.



Joseph S. Brady

A. C. Daly

"I put the Luster ON, and keep fingerprints OFF," says KEMO

These unretouched photographs tell the amazing story of Luster-on, the new chemical bright-dip for zinc-surfaced parts. Luster-on also protects against fingermarks, salt spray, white corrosion and age-stains. A good basic zinc surface can be made positively mirror-like with Luster-on.

Luster-on gives corrosion protection far superior to other known plating baths or bright dips on zinc. Any plater can use Luster-on readily. Now available in 13-gallon carboys — or send the coupon for full particulars.

KEMO SAYS: Sorry we can't send samples of Luster-on, but we will process and return pieces of work sent to us.

THE Chemical CORPORATION
93 Broad St., Springfield 5, Mass.

THE CHEMICAL CORPORATION
93 Broad St., Springfield 5, Mass.

Please send me full particulars about Luster-on bright dip for zinc surfaces. I am (am not) sending sample part for free dip. No obligation, of course.

Name.....

Address.....

Metal Finishing, February, 1945

Mr. Brady has had a long active career in industry and particularly in the field of metal cleaning which has made him thoroughly conversant with all its details and problems. A graduate of the University of Rochester, he has also taken special studies in chemical engineering at Lehigh University. He was formerly with the Eastman Kodak Company in their Technical Chemicals Department. Following that, he spent several years with Oakite Products, Inc., as Research Chemist.

Mr. Daly has also had a long practical and technical experience in the metal cleaning field. A graduate of Rutgers University, he was formerly with Wright Aeronautical Corp., Paterson, N. J., as Process Engineer on production metal cleaning. More recently he has been with the Magnus Chemical Company as Consultant on metal cleaning problems. For several years, Mr. Daly was Technical Field Representative for Oakite Products, Inc.

Mr. Brady will be in charge of the Optimus Technical Laboratory. Mr. Daly will be assigned to special technical work in the field. Both will also work in conjunction with the Optimus affiliate, *Optimus Equipment Company* of Matawan, N. J., manufacturers of metal cleaning equipment and dryers.

Detrex Corporation, Detroit, Mich., manufacturers of alkali cleaning compounds, industrial cleaning equipment, dry cleaning machines and oil-extraction plants is holding a series of meetings in the company's various sales areas. These meetings have a dual purpose; to mark the beginning of the corporation's 26th year in business, and to cover present and contemplated developments in the manufacture of various Detrex products.

The first of these meetings was held in Detroit on January 12, 1945, the anniversary of the founding of the company in 1920. Members of the Detrex organization in the Eastern region met at Hershey, Pa., on January 19 and 20. Western, Pacific and Southern regions have planned early meetings.

At the Detroit meeting, *Robert A. Emmett*,

CHROMIC ACID

99.75% PURE

With two complete, independent plants at Jersey City and Baltimore, and its own supply of the basic raw material Chrome Ore from company owned and operated mines, Mutual is the world's foremost manufacturer of Chromic Acid.

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R. A. Emmett

president and chairman of the Board and member of the original partnership which started the business, traced the history of the company from the days when all manufacturing operations were performed in a small garage to the present time with the corporation occupying more than 120,000 square feet of floor area in its modern Detroit plant. He also announced the election of two Detroit executives to new posts. *A. O. Thalacker* becomes vice-president and general manager and *E. W. Allison* is now secretary of the company. Other officers of the firm include *C. F. Dinley*, vice-president in charge of engineering and manufacturing; *G. E. Powers*, treasurer, and *W. W. Davidson*, vice-president and general sales manager.

News from California
By FRED A. HERR

Charles A. Russill, proprietor of the *Russill Plating Works*, 1320 S. Grand Ave., Los Angeles, effective January 2, sold his plant and equipment to *A. L. Specer* and *Joseph Wiseman*, two progressive members of the younger generation of platers in Southern California.

Mr. Specer, in partnership with *Spencer Wright*, has been operating the *S&W Plating Co.* at 1356 W. 25th St., Los Angeles, specializing in anodizing, cadmium and zinc plating and the treatment of magnesium. His new partner, Mr. Wiseman, has been active with a precision instrument company in recent months.

In taking over the Russill Plating Works, Mr. Specer pointed out, he has available a wide range of equipment which material shortages made it impossible to add to the other plant. The Russill shop is equipped with some 10 or 12 tanks and vessels for nickel, copper, bronze, gold, silver, rhodium and other solutions, and polishing equipment to handle practically any kind of work. Replating and repairing of surgical instruments had been one of Mr. Russill's special-

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tion in addition to which he did much work in metal coloring and oxide finishing.

Mr. Russill had occupied the South Grand Ave. location for the past year and prior to that had operated shops at 1407 Esperanza St. and at other locations in Los Angeles for some 23 years. His career goes back another 20 years in other communities.

Spencer and Wiseman propose to continue operations as the Russill Plating Works, a name which ranks among the most solid and respected in the metal deposition field on the West Coast.

Although he cited as reason for selling out his desire to "retire" (this is the fourth time Mr. Russill has tried to retire), he already has plans underway for engaging in the manufacture of miniature plating equipment after the conclusion of a month's vacation. He plans to manufacture such items as miniature pickling outfits, rheostats, tumbling barrels, etc., designed for specific handling of small jobs.

"Many jobs come into a plating shop which call for work on odd lots of small items which must be kept separate," Mr. Russill explained to this reporter. "Handling such jobs in regular equipment results in a loss in most cases. A party might want a half gross of screws, or some other odd lot of small items, treated. If this work is done in regular equipment, chances are no satisfactory profit can be made. A miniature barrel and auxiliary equipment designed to size will make it possible to do jobs of that nature at a profit."

Mr. Russill planned to spend the early weeks of the new year in perfecting his designs, locating a suitable plant and assembling the necessary machinery.

Another veteran of the plating industry, a pioneer in metal deposition in Southern California, withdrew from the active scene in January when *Gene Bedwell*, co-operator of the *DeLuxe Plating Co.*, Los Angeles, sold out to *Trophy-Craft Co.* of Hollywood (*Bob Dettard and Ed Gill*), to retire to his ranch in the Coachella Valley near Indio, Calif.

Gene and his brother *Don*, now proprietor of the Bedwell Plating Co., 1344 W. Slauson Ave., Los Angeles, have been identified with metal finishing in Los Angeles since the turn of the century. In 1905, the brothers took over the old Thorpe Plating Works in Los Angeles, where Don had been working for some time as a plater's helper and plater. They disposed of the plant in a year or two and worked for a while in various shops.

In 1910 the brothers got together again in the joint ownership of the Main Plating Works, which they operated until 1912, when Don went with Thomas Day Co. in San Francisco, while Gene continued to operate the Main Plating Works. That plant, subsequently was merged with the Bailey-Blaisdell plant and by 1919 had developed into the imposing Acme Plating Co., with Gene Bedwell, Bailey, George Dell and Joe LaVoe as partners.

Gene Bedwell sold his interest to Frank Burn in 1920 and operated a gasoline service station for several years. His return to plating occurred in 1924 when he and Brother Don began operating the DeLuxe Plating Co. in Los Angeles.

Don withdrew in 1936 to handle metal finishing for the Halenscheid-McDonald Co. till the outbreak of the war, and thereafter to engage as an independent plating shop operator at 1344 W. Slauson Ave., his present occupation. Since 1936, Gene Bedwell and A. L. Huntley have been operating the DeLuxe Plating Co. at 1242 Valencia St.

With Gene Bedwell's retirement, there have passed from the active scene in Southern California during the past 60 days three men whose activity in the industry spans more than 40 years each, The others are Charles A. Russill of the Russill Plating Works, and John Merigold, whose notable career of 52 years i.. the industry was sketched in this column in December.

Marcus Rynkofs, head of *Liberty Plating Co.*, Hollywood, was hospitalized early in January with a severe attack of influenza, but a report given at the January 8 meeting of Los Angeles Branch of the *American Electroplaters' Society* by *Ernest Lamoureaux* revealed that Mr. Rynkofs had successfully weathered the crisis and expected to return to his home shortly.

The Western States Lacquer Co. is erecting a $5500 laboratory building at its main plant, 4400 East Washington Blvd., Los Angeles.

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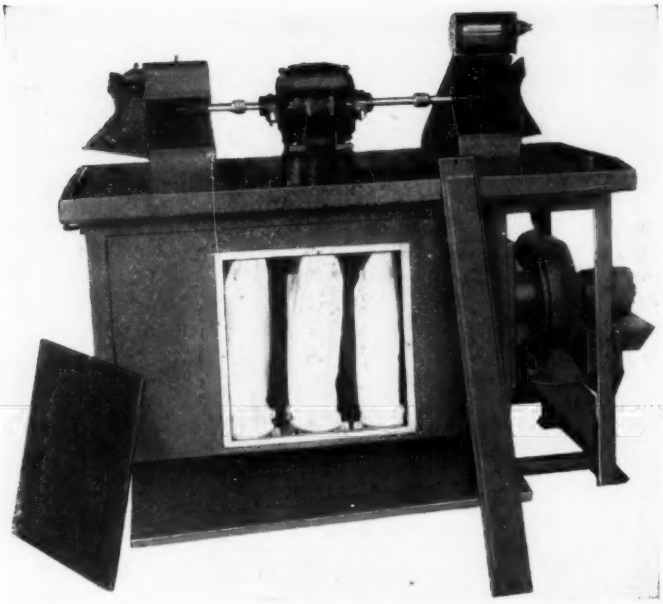

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Associations and Societies

American Electroplaters' Soc
Los Angeles Branch

Inspired by the latest membership lation which showed the branch as only 0.8% from the top in the first *Los Angeles Branch* of the *A.E.S.* six new members at its first meeting the year, held January 8 in the Ro Hotel.

With the beautiful national membe trophy, emblematic of the branch's vi in an earlier drive, on display, Pres *Joseph Sunderhaus* initiated the follo new members:

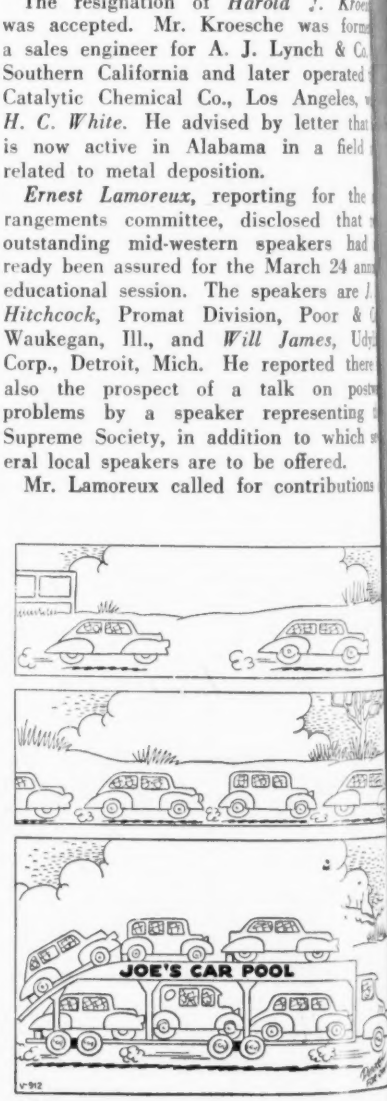
Harley J. McQueen, Arrow Plating *James C. Williams*, Bendix Corp.; *Wi Jones*, Smith-Emory Co.; *Thomas Tu* A. J. Lynch & Co.; and *Glenn A. Hall Edward B. Straeker*, U. S. Dry Dock, Angeles Harbor. All the above are ac members.

Transferred from Buffalo, N. Y., Br was *Silas Peacham*, who now resides Upland, Calif.

The resignation of *Harold J. Kroe* was accepted. Mr. Kroesche was form a sales engineer for A. J. Lynch & Co. Southern California and later operated Catalytic Chemical Co., Los Angeles, *H. C. White*. He advised by letter that is now active in Alabama in a field related to metal deposition.

Ernest Lamoreux, reporting for the rangements committee, disclosed that outstanding mid-western speakers had ready been assured for the March 24 ann educational session. The speakers are *Hitchcock*, Promat Division, Poor & Waukegan, Ill., and *Will James*, Udy Corp., Detroit, Mich. He reported there also the prospect of a talk on post problems by a speaker representing Supreme Society, in addition to which s eral local speakers are to be offered.

Mr. Lamoreux called for contributions



plated articles to the products exhibition which will be a feature of the session and obtained the promise of several members that they would collaborate in the preparation of a panel of metal colored items.

As the speaker of the evening, *Earl Coffin*, Educational Committee chairman, introduced *Charles A. Russill*, a practical plater for more than four decades, who presented an extemporaneous talk on "Oxide Finishes." Because of the keen interest of the audience, the subject branched out into a broad discussion of metal coloring of the past and present and speculations concerning what the postwar period will develop in that field.

Mr. Russill predicted that ornamental metal parts, colored in various finishes, such as hinges, knobs, strip borders, window frames, even picture frames of metal, will figure to a larger extent than ever in the construction of postwar homes. He expressed the opinion that metal coloring will experience an expanded demand after the war and urged alert plating shop operators to take timely steps to share in that volume of business.

Mr. Russill began his talk by reading some 10 or 12 formulas for oxide finishes from cards which he said had been distributed by the Egyptian Lacquer Mfg. Co. more than 40 years ago. Most of them are still accurate for use today, he disclosed. He discussed briefly past and present methods for the use of such solutions as black oxide for brass, bardediene bronze, brown oxide for brass, statuary bronze, deep brown on copper, black oxide for aluminum, and a verde antique finish.

Several interesting points about oxidization were brought out as Mr. Russill discussed his subject in an informal manner, interrupted now and then by some member who offered additional information that had come to his attention.

Thus, it was brought out, the city of Paris many years ago had decided to restore the sheen to the many bronze statues which the French capital contains. The process which worked best, it developed, was when the statues were wiped at intervals with olive oil. The percentage of salt which the oil contains, it was explained, was instrumental in restoring the original sheen to the bronze in an effective manner.

"Oxidization of metals is actually a deterioration of metal and by using different mixtures, different colors, shades and textures can be obtained," said Mr. Russill.

"You cannot definitely determine in advance just what effect will be obtained in antique or oxide finishes. In respect to a great many finishes, it is not advisable to use lacquer. On the whole, waxes and oils are better."

Mr. Russill, a veteran of the trade, explained that whenever he discovers that some new kind of shade or texture has developed from a solution he is working on, he stops work immediately to jot down reference notes on the formula, the type of metal and other pertinent data that will enable him to pursue the process at greater length when the job at hand has been completed.

The speaker cited a practice which was

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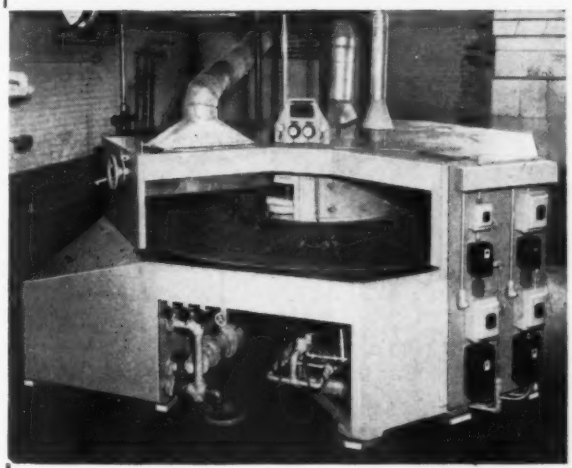

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not too uncommon among the less scrupulous platers of the old days.

"An occasion would arise in which they could approximate, but not quite match the coloring on a sample of metal which had been brought in to match," explained Mr. Russill. "After trying several times but not quite managing to get a match, some shop operators would solve the problem by refinishing the sample to match the finish they had gotten."

No reputable plater would engage in such a practice today, Mr. Russill declared, and besides, he explained, modern check backs are too thorough, particularly on large contracts.

"I have had jobs on which I was asked to submit several metal samples of proposed finishes," Mr. Russill declared. "The samples were in metal sheets about six inches long and two inches wide. When the desired finish was selected, the contractor of the building for which the parts were intended, would have the final sample cut into sections. He would retain one himself and give one other to me. My finished work had to match the second part of the sample the architect had retained. A plating shop operator indulging in short-cuts under those conditions would find himself in a very bad situation."

Boston Branch

The *Boston Branch* of the *A.E.S.* will hold its Tenth Annual Technical Session and Banquet on March 3, 1945, in the Georgian Room of the Hotel Statler.

The Technical Session will open promptly at 1:30 P.M. with Mr. George B. Hogaboom, Sr., presiding. The speakers and subjects are as follows: *Mr. R. R. Bair* of E. I. duPont de Nemours & Co., Niagara Falls Laboratory —"Recent Developments in Cyanide Zinc Plating"; *Dr. Ralph Lee* of Public Relations Dept., General Motors Corp., Detroit, Mich. —"Human Engineering"; and *Mr. Arthur W. Logozzo*, of Nutmeg Chrome Plating Co., Hartford, Conn.—"Hard Chromium Plating."

The Banquet will be held in the evening, followed by entertainment, dancing and awarding of door prizes. This Gala Event celebrates the 25th year of active participation by the Boston Branch in the A.E.S.

Indianapolis Branch

The *Indianapolis Branch* of the *American Electroplaters' Society* held the first meeting of the new year, January 3, 1945, at the Hotel Riley, Indianapolis, Ind. A chicken dinner was served at 6:30 P. M. The business meeting was called to order at 8:00 P. M. by the president, *Mr. A. L. Chesterfield*, and was attended by 35 members and guests.

Mr. Chesterfield introduced *Lt. Craig*, a Piper Cub pilot in the Artillery and more recently a patient of Billings General Hospital, who told of his experiences in the Army. He told of his training in the United States and Great Britain, the part he played in the invasion of St. Lo, and how the Artillery used Piper Cub airplanes to a great advantage. The speaker enumerated a number of humorous events which had occurred during his service in the Army. He concluded his talk by answering a number of questions asked him by members present

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ed by thanking the Branch for asking him to speak at their meeting.

The remainder of the evening was devoted to old and new business of the Branch. The secretary's and treasurer's reports were read and approved as read.

The Branch elected *Harley K. Grund* to active membership and *Lawrence C. Hesoun* to associate membership.

The Indianapolis, Dayton, Cincinnati joint meeting was discussed. President Chesterfield discussed tentative plans he had made for holding the joint meeting in Indianapolis. He pointed out that ample time was available to work out a well planned program. He appointed several of the members to check on details which must be worked out immediately and instructed them to report back to the Branch at its next meeting to be held February 7, 1945. The date of the joint meeting has been tentatively set for May 19, 1945 and shall consist of an educational session followed by a dinner dance.

The meeting was adjourned at 9:45 P. M.

Carl R. Morris.

Rochester Branch

Rochester Branch of the *A. E. S.* held the regular monthly meeting Friday evening, January 19, 1945, at the Hotel Seneca. President *John Q. Adams* called the meeting to order at 8:00.

Minutes of the previous session were read and approved and the financial report to date was given. All correspondence was read.

Mr. Paul Tufts was chosen for a membership chairman and *Mr. Fred Bruening* was chosen for assistant membership chairman. As chairman of exhibits for the Rochester Branch at this year's conference in Pittsburgh, *Mr. Elmer Nill* was appointed. Applications for three new members were read and approved. The new members are *Mr. John Lenzi, Mr. John K. McIver, Mr. John Yanson.*

Speaker for the meeting was *Mr. L. W. Burton*, an engineer with the Tungar and Metallic Rectifier Division of the General Electric Co. Mr. Burton discussed the practical aspects of what can be expected in the way of service, maintenance cost and overall performance of electroplating rectifiers. His lecture was illustrated with slides of typical installations.

All members were very interested in Mr. Burton's presentation and this was a very educational and instructive session.

The meeting was adjourned at 10:15.

Donald C. Blum.

Toronto Branch

Toronto Branch of the *A. E. S.* held its January meeting on the 12th. About forty members attended, and one applicant was elected to active membership. The euchre party which is usually held on March 17th will be given on March 14th this year. The exact date of the annual dance is not fixed but it will be about April 27th.

Two members were suspended for non-payment of dues.

The speaker for the evening was *Mr. W. A. Helbig*, Chemical Engineer, *Darco Corp.*, New York, N. Y., who spoke on

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"Filtering of Plating Solutions Using Activated Carbon." Mr. Helbig held the attention of the forty members present for one hour and fifteen minutes and was given a rousing vote of thanks for the very informative talk. Lantern slides illustrated the lecture.

Meeting adjourned at 10:10 but group discussions continued for a half hour later.

Mr. W. M. Phillips, Electrochemist, *General Motors Corp.,* Detroit, Mich., is scheduled as speaker for the February meeting. His subject will be *"Plating in Motion."*

W. S. Barrows.

The Job or Contract Electroplating Business in 1944

Following is a brief report on the industry from the *Masters' Electro-Plating Association,* 123 William St., New York, N. Y., which covers the Metropolitan District.

This Association comprises 70 member shops whose output is estimated at over 75% of the total plating work done in the Metropolitan District.

Business Developments

The rate of operations for 1944 rose from 82½% of capacity in January to a high of 88½% in November, and closed at 87¼% in December. The average for the year was 86½%. This compares with an average of 78% in 1943.

In view of the increasing number of signs of a future decline in operations (although actual operations continued at a high level) and in view of the increasing number of cancellations and cut-backs, the Association has advised its members to refrain as far as possible from making large capital expenditures for expansion at this time, but to restrict these expenditures to reconditioning and conversion for coming civilian work.

A substantial amount of civilian work has begun to appear in the member shops resulting from spot authorizations by the WPB to customers.

OPA Regulation

The OPA established a *Plating and Enameling Industry Advisory Committee* to effectuate the purposes of the Emergency Price Control Act. Two of the members of this committee are members of the Masters' Electro-Plating Association, *Philip Sievering* (Philip Sievering, Inc.) and *Henry Weitze* (Carlton-Cooke Plating Corp.).

The OPA later issued a new Proposed Regulation to cover electroplating among other industrial services. This Proposed Regulation was taken under serious consideration by the Association, and meetings were held in New York and in Boston, Washington and Chicago, with platers from New England, Chicago, Detroit and Los Angeles. Counsel was retained to help draft suggestions for revisions and amendments to this Proposed Regulation, and these suggestions have been placed before the OPA.

At the time of writing, this Regulation has not yet been issued, but the Association is fully organized to take the necessary action when it is issued, to work under it and apply for amendments, supplementary regulations, etc.

WMC Regulations

An important concession to the Electroplating Industry was made by the WMC in their inclusion of Electroplaters in the List of Critical Occupations entitled to deferment by draft boards. They also continue Metal Finishing on the List of Essential Activities.

Labor

The members of the Association who have contracts with Metal Polishers International Union, Local No. 8, have been in extended negotiations with the union on the question of rate ranges, job definitions and other elements in their contracts, with a view to agreeing upon a master contract for all these shops. At this time negotiations are moving toward an agreement have broken down and the matter will be brought before the NWLB as a dispute case.

The Masters' Electro-Plating Association joined in a campaign for the control of business rents which was sponsored by the American Business Congress. As a result of this campaign a Bill has been introduced in the New York State Legislature to prevent unfair or excessive increases in business rents.

Necrology

We grieve to report the passing away

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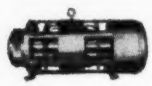

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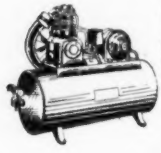

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AT BROADWAY

Albert D'Agostino, head of Albert's Plating Works in Brooklyn, on Feb. 18, 1944.

New Members

The following firms have joined the MEPA during 1944:

Everready Plating Co., 1790 First Ave., N. Y.

Automatic Plating Co., 620 W. 44th St., N. Y.

Royal Plating Works, 339 Canal Pl., N. Y.

Hygrade Chromium Plating, 422 E. 92d St., N. Y.

Electro-Plating Service Co., 7-11 Bronx St., White Plains, N. Y.

Lower-Style Metal Prod. Corp., 40-24 22d St., L. I.

B & F Plating Co., 116 Fulton St., N. Y.

Prospects and Plans

The prospects for 1945 are clouded with uncertainty. Operations still continue at a high level but it is generally known a sharp falling off will ensue immediately upon the cessation of hostilities with Germany. Members are therefore advised to prepare for a recession in actual operations, as indicated by the present falling off in unfilled orders resulting from cancellations and cut-backs. With this in view, the Association has definite plans for the coming year which include the following:

1. Further study and education of the Members in the practice of estimating and cost finding.

2. Study and education of Members in methods of operation under the new OPA Regulation for the industry, when it is issued. This work will tie in closely with the work on estimating and cost finding.

3. A close watch and as much control as possible over the labor situation, in order that the wage rates and other elements in union contracts may make it possible for the shops to operate safely at a reduced rate of output.

Obituaries

Thompson W. Kirby

Thompson W. Kirby, president of *A. T. Wagner Co.*, died January 7, after several months illness. Mr. Kirby was born July 16, 1879, at Guelp Township, Wellington County, Ontario, Canada. He attended public schools and business college there and in 1906 started to work for the Canadian Stove Manufacturing Association as executive secretary. Later he was affiliated with the *Gurney Tilden Co.*, of Hamilton, and *Kir-Ben Ltd. Co.*, of Almont. In 1907 he went with *Osborn Manufacturing Co.*, of Cleveland, Ohio, as assistant manager of the Cleveland branch. In 1925 he came to Detroit with the A. T. Wagner Co., as sales manager and after Mr. Wagner's death he became president of the company. His background throughout these many years has always been in foundry and plating industry.

Mr. Kirby is survived by his wife, a son

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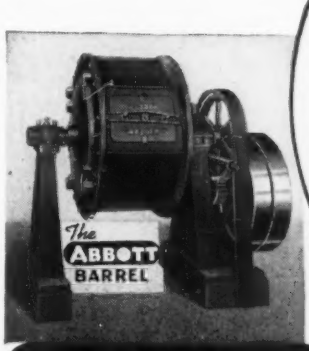

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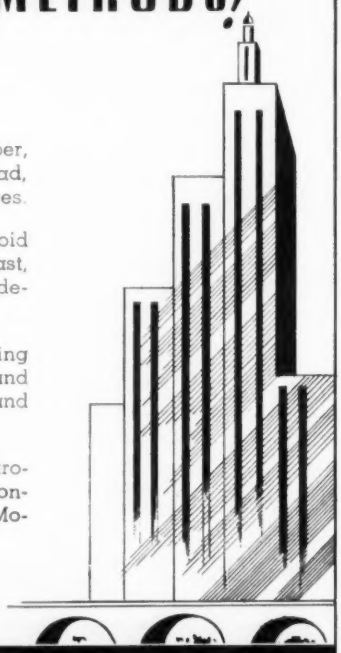

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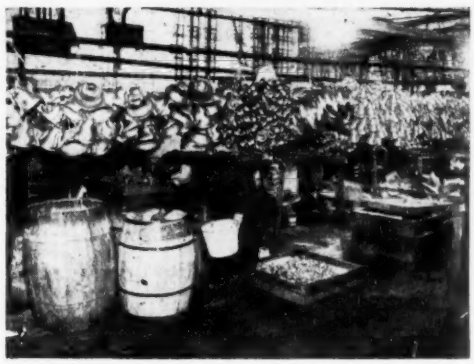

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and two daughters. He is well known in the metal finishing industry and was a member of the Advisory Committee, Electro-Plating Industries, W. P. B., Washington, D. C., American Electroplaters' Society, Detroit Yacht Club, Detroit Curling Club, Chatham Curling Club, Masonic Order and Knights Templar of Hamilton, Ont., and Moslem Temple A. O. N. M. S., Detroit.

Lt. Joseph B. Schwartzkopf

The Indianapolis Branch of the American Electroplaters' Society regrets to announce the loss of one of its members, *Lt. Joseph B. Schwartzkopf.*

The Navy Department informed his parents by telegram that Joseph (Joe) Schwartzkopf, USNR, had died November 23, 1944, in the service of his country.

Joe was a graduate of Indiana University having received his A.B. in Chemistry in 1936, and his A.M. in 1937. At the university he was a member of Phi Kappa Psi, Alpha Chi Sigma, Phi Lambda Upsilon, Phi Eta Sigma, Kappa Kappa Psi, Blue Key, Senior Siwash Committee and Phi Beta Kappa.

For a time he worked at *Noblitt Sparks Industries* and in September 1941, was elected to associate membership in the Indianapolis Branch of the American Electroplaters' Society.

In January, 1942, Joseph Schwartzkopf entered the Navy as an Ensign. Following his training at Fort Schuyler in New York, he was stationed for a time at the Naval Ordnance Plant in Indianapolis. After some additional training, he was sent to the Pacific area as an Aviation Gunnery Officer, and had been in the Pacific about sixteen months at the time of his death.

The Indianapolis Branch of the American Electroplaters' Society wish to share their sympathies with his parents and friends and hope he will ever be remembered as a man who gave his life that we may work and live in a country where free enterprise and democracy thrive.

Manufacturers' Literature

Grinding and Finishing

Four helpful new publications illustrating and describing the popular *3-M Method of Grinding and Finishing* have just been released and are available upon request from *Minnesota Mining and Manufacturing Company*, Dept. MF, Saint Paul, Minnesota.

The largest booklet in this new series entitled "Step Up Production with the 3-M Method of Grinding and Finishing" is designed to provide purchasing agents, work managers, production managers, chief engineers and plant superintendents with the latest, up-to-the-minute facts and information on this speedy, economical grinding and finishing method, in the most concise, practical and usable form.

The three smaller booklets in the series deal individually with the 3-M Method as applied to the grinding and finishing of small parts and tools, heavy duty grinding and finishing of flat or curved surfaces, and the 3-M Method employing a semi-portable unit for grinding and conditioning raw metal stock, armor plate, billets, sheets and tubes.

Profilometer Catalog

Complete descriptions and illustrations of all Profilometer equipment are included in a new catalog just published by *Physicists Research Co.* Specifications and prices are given for the Profilometer and its accessories for measuring surface roughness.

The catalog also contains four pages of information on the nature of surface roughness, and a non-technical description of how the Profilometer measures it for production inspection purposes.

This catalog is an enlargement of the former publication entitled "Practical Surface-Roughness Measurement." The new edition contains 20 pages; is standard 8½" x 11" for convenient filing. Copies may be had at no charge on request to Physicists Research Company, Dept. MF, Ann Arbor, Mich.

Accident Prevention

High interest in accident prevention measures was indicated in the responses received by *The Elwell-Parker Electric Company* following publication earlier this year of a set of safety rules for the operation of power industrial trucks. A large number

LaMOTTE CONTROL EQUIPMENT
for the
ELECTROPLATER and ELECTROTYPER

As an aid in the control of plating baths of
NICKEL, ACID ZINC, TIN, CYANIDE
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LaMotte Block Comparators

for pH tests to accurately control the acidity and alkalinity of nickel, zinc, tin or cyanide baths. Inexpensive and easy to operate. A test can be made in a few minutes.

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Originators of the Practical Application of pH Control
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GOLD, SILVER, NICKEL, COPPER
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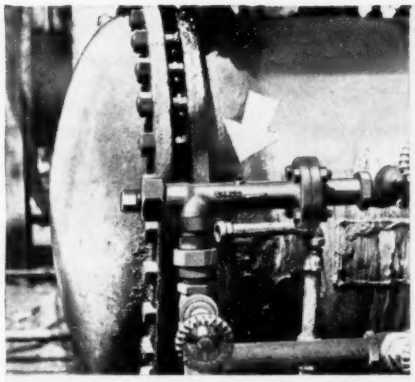

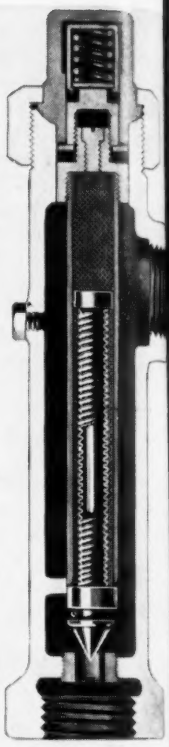

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No. 87

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requests were received for additional copies of the safety rules in a form which could be carried by the operators. Therefore, the company has had the rules printed on a pocket-size cardboard folder, with corners rounded and the surfaces varnished for greater durability. Each of the 34 safety rules is presented as a brief suggestion followed by a short explanation or discussion, and they are applicable to the operation of all makes and types of power trucks. Copies may be obtained on request from The Elwell-Parker Electric Company, Dept. MF, 4205 St. Clair Ave., Cleveland 14, Ohio.

Carbon and Graphite

National Carbon Co., Inc., has issued a new, 20-page bulletin describing and illustrating a variety of carbon, graphite and "Karbate" products manufactured by the company for use in the Chemical, Metallurgical, Mechanical, Electrical and other industries. The products are presented in sequence as applying to each of these industries, and there are many charts and tables covering the physical and chemical properties, together with application and operational data on these products.

Copies are available by writing to the National Carbon Co., Inc., Dept. MF, 30 E. 42nd St., New York 17, N. Y.

Degreasing and Cleaning

W. D. MacDermid Chemical Co., Dept. MF, Bristol, Conn., has published a new folder titled *Shop Information about Ferrodex*. This folder explains the applications and uses of Ferrodex, an electrolytic cleaner, and other developments by the company.

Copies are available by writing to the company at the above address.

Filtration

T. Shriver & Co., Inc., Dept. MF, Harrison, N. J., has issued a new 20-page catalog No. 45. This catalog describes and highly illustrates the company's line of filter presses.

Copies of this catalog are available by writing to the company.

Fluxes

A new catalog describing the complete line of "Superior" Fluxes is announced by *Superior Flux Company*, Dept. MF, 913 Public Square Building, Cleveland, Ohio. Included in the line are 20 fluxes for welding, brazing, silver soldering, soft soldering and low temperature alloy welding of ferrous and non-ferrous metals and alloys.

Fluxes for silver soldering and similar operations are offered in both paste form and powder form. Different fluxes are available for welding, brazing and soldering all forms and alloys of aluminum. For cast iron and for copper there are both welding and brazing fluxes, and for stainless steel there are welding and soldering fluxes.

For each flux listed there is included a detailed statement of its characteristics and a full schedule of list prices. The catalog

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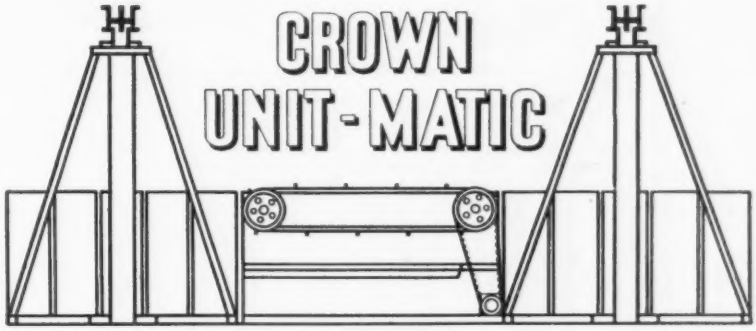

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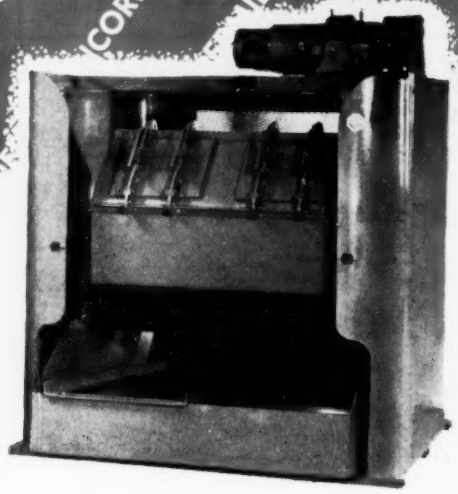

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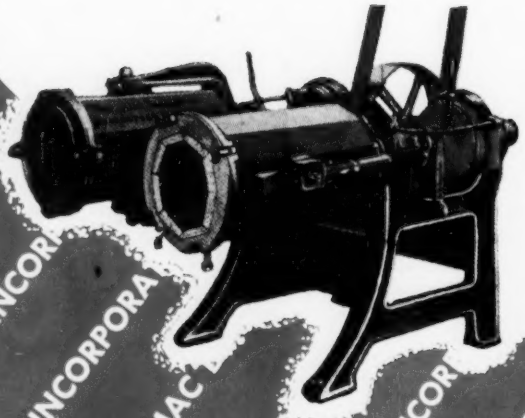

Headquarters for Supplies

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